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ABSTRACT

Having examined the emerging evidence and considered the doubts and cautions, the National Association of State Boards of Education (NASBE) Study Group on e-Learning concludes that e-learning will improve American education in valuable ways and should be universally implemented as soon as possible. The primary goal of this report is to provide a sufficient context so that education policy leaders can ask the right policy questions and take the lead on developing sound e-learning policies. Following are the major policy opportunities identified by the Study Group. Restructuring the public education system to maximize the benefits of e-learning requires attention to basic policy foundations that influence the day-to-day behaviors of teachers, administrators, and students. Reengineering the system should include: revising learning standards; bringing state assessments online; streamlining policies; empowering families; and moving beyond geographic boundaries. The Study Group firmly believes that the most valuable benefit of e-learning is its potential ability to delivery high-quality instructional services to all learners regardless of location, family or cultural background, or disability. Assuring universal opportunity is a critical policy foundation, and should include: ensuring high-quality educators for all children; providing access to robust equipment and the Internet at school; providing after-school access; and supplying technologies to assist students with special needs. Making available appropriate e-learning resources for a quality education raises complex policy questions that can challenge basic assumptions governing the traditional education system and settled ways of doing business. Fundamental change can occur during this

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exciting time, including: offering online courses for credit; determining effective ways to rapidly expand the availability of high-quality e-learning resources; and developing and/or revisiting policies addressing appropriate student use of the Internet, privacy protection, and advertising in public schools. (Contains 180 references.) (AEF)

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# Any Time, Any Place, Any Path, Any Pace:

## *Taking the Lead on e-Learning Policy*

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NASBE
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# Any Time, Any Place, Any Path, Any Pace:

## Taking the Lead on e-Learning Policy

NASBE
NATIONAL ASSOCIATION OF STATE BOARDS OF EDUCATION

The Report of the NASBE Study Group on e-Learning: The Future of Education

2001



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Additional copies of ***Any Time, Any Place, Any Path, Any Pace: Taking the Lead on e-Learning Policy*** are available for $14.00 each plus 10% for shipping and handling ($4.00 minimum) from NASBE at 277 South Washington Street, Suite 100, Alexandria, VA 22314. All orders under $50.00 must be prepaid. Call 800-220-5183 for more information. Volume discounts available.

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# Executive Summary

In fits and starts, public education is undergoing a makeover of historic dimensions. The slogan adopted by the Florida Virtual School succinctly describes a compelling vision for a transformed education system, one in which "any time, any place, any path, any pace" learning is delivered through modern technologies that are available today. Evidence to date convincingly demonstrates that, when used appropriately, electronically delivered education—"e-learning"—can improve how students learn, can improve what students learn, and can deliver high-quality learning opportunities to ***all*** children.

Having examined the emerging evidence and considered the doubts and cautions, the NASBE Study Group on e-Learning concludes that ***e-learning will improve American education in valuable ways and should be universally implemented as soon as possible.*** Technology is not a solution in isolation, but rather a key component that helps make it possible for schools to address core educational challenges.

However, the uncomfortable reality is that education leaders are not currently driving the policy agenda. Rapidly moving trends are outpacing the ability of policymakers to keep up. In the absence of firm policy guidance, the nation is rushing pell-mell toward an ad hoc system of education that exacerbates existing disparities and cannot assure a high standard of education across new modes of instruction. By allowing this policy vacuum to continue, education leaders are failing to meet their obligation to assure that all students are provided a quality education.

***State education policymakers should seize the opportunity to take the lead and move decisively to assure that e-learning spreads rapidly and equitably, is used well, and strengthens the public education system.*** The time is ripe for state boards of education and other state education leaders to think through the various policy questions, consider the implications, and adopt policies that will drive the technology in directions that effectively maximize student achievement—for ***all*** students.

The primary goal of this report is to provide a sufficient context so that education policy leaders can ask the right policy questions and ***take the lead*** on developing sound e-learning policies. Following are the major policy opportunities identified by the Study Group:

## Reengineering the System

Restructuring the public education system to maximize the benefits of e-learning requires attention to basic policy foundations that influence the day-to-day behaviors of teachers, administrators, and students.

- **Revising learning standards:** Revisit what should be stressed in state and district academic standards.
- **Bringing state assessments online:** Develop and implement computer-based assessment systems.
- **Streamlining policies:** Adopt or revise state and local policies for efficient administration of e-learning and review policies that can result in counterproductive incentives or inhibit e-learning.
- **Empowering families:** Consider the extent to which the public education system should offer and provide choices to families among different ways of organizing and delivering learning services.

- **Moving beyond geographic boundaries**: Determine how best to work through policy issues that cross state boundaries.

## Assuring Equity

The Study Group firmly believes that the most valuable benefit of e-learning is its potential ability to deliver high-quality instructional services to all learners regardless of location, family or cultural background, or disability. Assuring universal opportunity is a critical policy foundation.

- **Ensuring high-quality educators for all children**: Redouble efforts to establish policies and programs to ensure that well-prepared and well-supported teachers are equitably deployed across all settings so that every student is served by instructional staff who provide effective guidance and assistance.
- **Providing access to robust equipment and the Internet at school**: Ensure that every student has access at school to the equipment, software, fast Internet connections, and other resources necessary to take full advantage of e-learning opportunities.
- **Providing after-school access**: Work with other agencies to ensure that every student has convenient and affordable access to e-learning opportunities when school is out.
- **Supplying technologies to assist students with special needs**: Establish policies and acquire funding to ensure that all students with special needs (disability, language, setting) effectively gain the benefits of online courses and other instructional resources in ways equivalent to other students.

## Delivering Quality Instruction to Learners

Making available appropriate e-learning resources for a quality education raises complex policy questions that can challenge basic assumptions governing the traditional education system and settled ways of doing business. This is an exciting time of innovation and experiment that provokes hopes—and fears—of fundamental change.

- **Offering online courses for credit**: Establish policies and procedures to encourage the universal availability of virtual schools and other opportunities for students to earn credit for taking a wide variety of classes online. A detailed checklist of issues that state education policymakers may wish to consider is included in the boxes on pages 43 and 44.
- **Providing other quality e-learning resources**: Determine effective ways to rapidly expand the availability of a wide range of high-quality e-learning resources.
- **Protecting children**: Develop and/or revisit policies addressing appropriate student use of the Internet, privacy protection, and advertising in public schools.

effective • electrified • emancipated • enabled • energetic • engaged • enhanced • enlivened • enriched • ensemble • equitable • essential • everyone • every place • everywhere • expanded • experiential •

# I. Wanted: Leaders Now!

**The Most Dramatic Play**

**We are helping write the script of the opening scenes of the most dramatic play educators have ever witnessed. Our grandchildren will write the final scene, and their children will enjoy its impact.**

Robert Tinker, the Concord Consortium[1]

In fits and starts, public education is undergoing a makeover of historic dimensions. The slogan adopted by the Florida Virtual School succinctly describes a compelling vision for a transformed education system, one in which "any time, any place, any path, any pace" learning is delivered through modern technologies that are available today. Evidence to date convincingly demonstrates that, when used appropriately, electronically delivered education—"e-learning"—can provide high-quality learning opportunities to ***all*** children. Having examined the emerging evidence and considered the doubts and cautions, the NASBE Study Group on e-Learning concludes that ***e-learning will improve American education in valuable ways and should be universally implemented as soon as possible.***

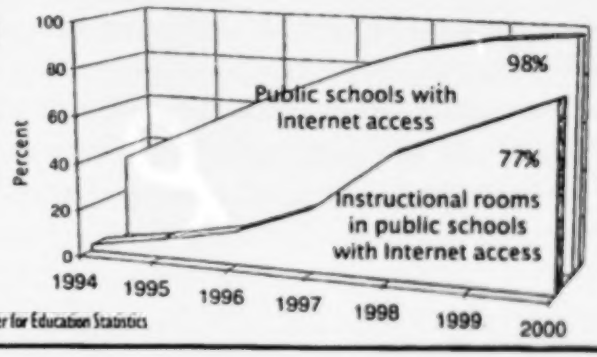
Rapid progress is in fact being made at turning this compelling vision into reality. Throughout the country, schools and districts are energetically acquiring computers and wiring classrooms to the Internet—an estimated $7 billion a year is being spent to equip schools with infrastructure, networking activities, and hardware.[2] The federal government's highly successful "E-rate" program has quickly brought modern communications services into 98 percent of America's schools and 77 percent of instructional rooms (see Chart 1 at right).[3] Nearly every state contains islands of innovation where educational technologies have been well integrated with impressive results.

The Study Group enthusiastically explored a wide variety of the policy challenges raised by the prospect of moving toward an education system that takes full advantage of e-learning. Pioneering states, districts, and researchers have developed practical solutions and worked out policies to govern many aspects of a transformed education system. Far-sighted policymakers can take advantage of the opportunity to address the exciting issues that are now on the doorstep of every state and school district.

***Yet the uncomfortable reality is that education leaders are not currently driving the policy agenda.*** Private capital has been pouring into the development of e-

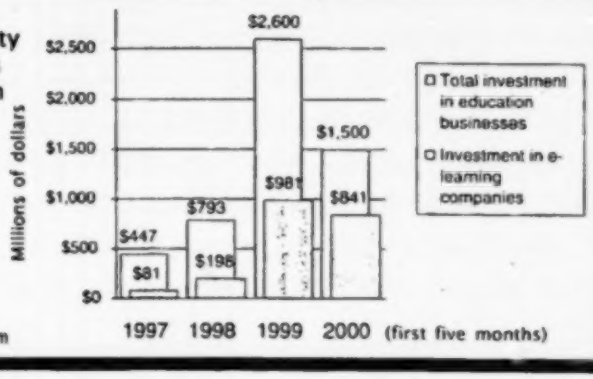
The uncomfortable reality is that education leaders are not currently driving the policy agenda.

Chart 1
**Rapidly Connected Schools**




Source: National Center for Education Statistics

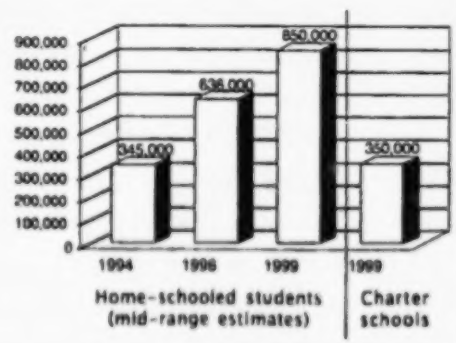
Chart 2
**Private Equity Investments in Education**




Source: Eduventures.com

learning resources (Chart 2).[4] Districts and schools are inundated with sales pitches from commercial vendors who are anxious to outfit classrooms and deliver hardware, software, and online learning services before a thorough and coherent policy framework is in place.[5] State legislatures are being heavily lobbied by special interests to immediately move ahead with hastily conceived e-learning initiatives that might not be the wisest use of funds, do not provide what educators most need, or establish proprietary standards that reduce competition. In a few states "cyber charter schools" that lack adequate accountability safeguards have emerged, seemingly overnight. The number of home-schooled students is rising rapidly (Chart 3), many of whom are served by private Internet-based education businesses that purport to offer a complete education online—with no independent assurance of value. The quality of education software and online resources varies greatly from exemplary to poor. One researcher opines that "90 percent of current educa-

Chart 3
**The Growth of Home Schooling**




Source: National Center for Education Statistics

The Power of the Internet for Learning

**The question is no longer if the Internet can be used to transform learning in new and powerful ways. The Commission has found that it can.**

**Nor is the question should we invest the time, the energy, and the money necessary to fulfill its promise in defining and shaping new learning opportunity. The Commission believes that we should.**

**It is time we collectively move the power of the Internet for learning from promise to practice.**

Web-Based Education Commission[6]

tional software is not worth buying—crowded with extraneous and time-consuming effects that accomplish little beyond distracting children and distancing them from real learning."[7]

These rapidly moving trends are outpacing the ability of policymakers to keep up. In the absence of firm policy guidance, the nation is rushing pell-mell toward an ad hoc system of education that exacerbates existing disparities and cannot assure a high standard of education across new models of instruction. Schools with large numbers of poor and/or minority populations are not only underserved by less-qualified teachers, they are also less likely to have access to online educational alternatives.[8] ***By allowing this policy vacuum to continue, education leaders are failing to meet their obligation to assure that all students are provided a quality education.***

Many people are thirsting for sound leadership on e-learning issues. Local educators are asking for state guidance on how to most effectively use their new equipment and communications services to improve instructional quality. Private vendors, too, are asking for clear direction so their products will satisfy state requirements. The general public strongly supports education technology; the September 2000 *Phi Delta Kappan*/Gallup poll found that 82 percent of the American public agreed that schools should invest more in technology.[9] Education policymakers do not have the luxury of time to ponder these issues unhurriedly—if they do not fill the leadership void, someone else will. Meanwhile, new opportunities—and attendant policy questions—continue to bubble up in rapid succession.

The pressure for quick policy action might be daunting to some, but the Study Group finds it an electrifying prospect. ***State education policymakers should seize the opportunity to take the lead and move decisively to assure that e-learning spreads rapidly and equitably, is used well, and strengthens the public education system.*** The time is ripe for state boards of education and other state education leaders to think through the various policy questions, consider the implications, and adopt policies that will drive the technology in directions to effectively maximize student achievement—for *all* students.

The Study Group determined that one reason why few states and districts have yet to adopt far-reaching policies is that many decisionmakers do not fully understand the core challenges raised by e-learning. Few education leaders feel able to ask the right questions, a necessary step in the process

Factors Driving Inevitable Change[9]

- **Learners have *open access to the Internet*, which supports interactive communication and provides access to powerful learning opportunities anytime and anywhere, beyond the boundaries of schools and classrooms.**
- **Interactive communication technologies give power to the findings and practical applications of *recent brain research* into how people learn.**
- **There is *so much to learn*—textbooks and curriculum frameworks cannot hope to adequately cover all the knowledge necessary for life today.**
- **America's economy has now reached a point where *work involves learning*—businesses are not competitive unless their workers are knowledge workers who continuously improve their knowledge, skills, and productivity.**
- **The *home is becoming a learning place*—powerful learning opportunities are available to children in the home, where a growing number of parents are working.**
- ***The kids get it!* Students come to school recognizing that they have more powerful learning opportunities available out of school than they have in school.**

of crafting practical policies. Therefore, the primary goal of this report is to provide a sufficient context so that education policymakers can ask the right questions and ***take the lead*** on developing sound e-learning policies. We do this in the following chapters by:

- describing the transformative power of e-learning;
- explaining the major issues;
- suggesting policy opportunities;
- providing examples of positive policy actions;
- offering critical policy questions that education leaders should explore; and
- highlighting the most current and most useful of the many available resources.

■

effective • electrified • emancipated • enabled • energetic • engaged • enhanced • enlivened • enriched • ensemble • equitable • essential • everyone • every-pace • everywhere • expanded • experiential •

# II. The Power of e-Learning

## Transforming how and what students learn

New classroom technologies available today have the potential to radically transform education as we know it. Successful learning no longer needs to depend on the random good fortune of always being assigned to the classes of master teachers who are both content experts and skilled learning facilitators. Instead, high-quality instruction in almost any given subject can be made available to any student of any age and any background. Once an interactive lesson or online course has been developed according to evidence-based design principles and academic content standards, and then proven to be educationally effective, it can be made available to any location where the necessary on-site resources are available. Students in a well-run "networked learning community" will be able to access the best educational resources from across the globe at any time of the day and year.

When designed and implemented well, interactive technologies are inherently motivating. And, as Sharon Johnston with the Florida Virtual School noted, "with e-learning, every student is in the front row." People recognize these benefits: in a recent poll by the Pew Foundation's Internet and American Life Project, 78 percent of teenagers said they believed the Internet helps them in school, and 87 percent of their parents agreed.[11]

In addition to improving ***how*** children are taught, modern technologies can also improve ***what*** children learn.[12] Deeper understanding of concepts and theories—as well as mastery of basic skills—is possible. The National Research Council notes that several features of e-learning technologies are consistent with the "new science of learning" derived from recent brain research.[13] Because the new technologies are interactive, it is easier to create environments in which students can learn by doing, receive feedback, continually refine their understanding, and build new knowledge. e-Learning can help students visualize and comprehend difficult-to-understand concepts through such methods as simulations and opportunities to engage in real-world problem-solving.

Do we know for sure that e-learning can specifically help to reduce academic achievement gaps between population groups? Unfortunately, large-scale research studies have not been conducted on the particular impact of education technology on students who are most at risk of school failure.[14] Yet small-scale studies have yielded promising results, and there is abundant anecdotal evidence that all students benefit when they have full access to the available opportunities and guidance from well-prepared teachers.

The results of a technology project evaluation in Union City, New Jersey, are instructive. The Center for Children and Technology found that deep and sustained access to technology has given Hispanic students from low-income families "a substantial leg up," significantly increasing their test scores in writing and mathematics.[15] But the evaluators stress a

> With e-learning, every student is in the front row.
>
> Sharon Johnston, Florida Virtual School

larger finding that "technology in and of itself, in the absence of other components of school reform, would not produce these kinds of changes." Using a major infusion of state funds, Union City has simultaneously pursued other reform initiatives, including effective school improvement teams, more instructional leadership, and extensive professional development. The researchers conclude that ***technology is not a solution in isolation, but rather a key component that helps make it possible for schools to address core educational challenges.***

## Transforming schools

Would the widespread use of e-learning mean the end of public schools as we know them? Yes and no

**In What Ways Do Computers Enhance Student Achievement?**

Consider some of the ways that computers and telecommunications technologies have enhanced student performance—all supported by research conducted in schools.

***By Engaging and Involving Students***

To young people, the computer is totally engrossing; they learn without even realizing it. Kindergartners discover the letters of their names, identify shapes, and learn to count while "playing" with well-designed software. Middle-schoolers engage in scientific inquiry when using probeware to test a local waterway for pollution and graph their findings using a spreadsheet. And high-schoolers examine facets of a very different world as they prepare their multimedia presentation exploring the relative influence of monarchy and church on medieval life. All have become active participants in meaningful learning experiences.

***By Empowering Students***

The new technology allows students to feel a pride of accomplishment when they view their output, be it a neatly formatted report, a colorful chart, or a desktop-published newsletter. Students become active producers of knowledge, whether they are sharing their findings with the world via a webpage or with their classmates via a PowerPoint™ presentation. And the computer's forgiving nature, which allows even the worst errors to be easily remedied, does wonders for sensitive young egos.

***By Fostering the Development of Higher-Order Thinking Skills***

Used for inquiry-based learning, new technologies allow students to develop the very same competencies identified as essential for the modern workplace. They learn to find and organize complex information, recognize trends and patterns, draw inferences, collaborate on a final product, and more. Research studies note that computer-using students demonstrate greater problem-solving and critical thinking skills compared to students in traditional classrooms.

***By Ensuring Student Mastery***

Because instructional software is an infinitely patient, nonjudgmental, one-on-one teacher, it allows each student to proceed through a topic at his/her own pace and repeat whenever necessary until mastery is achieved. Students preparing for rigorous college entrance exams find that their task is easier with SAT/ACT preparation software. And where whole-class tutorials are necessary, today's sophisticated Integrated Learning Systems can track each student's progress, prescribing lessons appropriate to ability levels.

National School Boards Association[16]

### e-Learning and Young Children

Higher education and the U.S. Education Department's Star Schools program have pioneered design and policy issues involved in "distance learning" courses and programs. Most recent literature on e-learning continues to emphasize academic courses for students of high school, and to some extent, middle school, age.

Yet with younger children one cannot assume a certain level of proficiency with learning methods, reading skills, and computer skills. The need to also tailor instruction to younger students' individual stage of development and learning needs makes the design and implementation of e-learning for younger children a more complex and challenging task. Some argue that the risks of getting it wrong are also greater.

Many experts caution against young children spending an inordinate amount of time in front of television and computers, in part because of greater risks for obesity and repetitive strain injuries.[17] Excessive computer use may also affect children's social development, and some kinds of violent games might predispose children to subsequent aggressive behavior.

In its recent report, *Fool's Gold: A Critical Look at Computers in Childhood*, the Alliance for Childhood called for an immediate moratorium on the further introduction of computers in early childhood and elementary education, except for special cases of students with disabilities, until much more has been learned about their effectiveness and shortcomings.[18] They believe that the benefits of computers for preschool and elementary school children have been overstated and the costs—"in terms of money spent, loss of creative, hands-on educational opportunities, and damage to children's physical and emotional health"—are not being adequately considered.

In response, the Web-Based Education Commission explicitly rejected the Alliance for Childhood's call for a moratorium, arguing that, "We believe that this call, if heeded, would squander a momentous opportunity in education. This Commission believes that we have sufficient evidence to know that the Internet—if used wisely—enhances education. We know it works."[19]

The traditional model of offering instruction only in dedicated, highly regulated facilities according to standard calendars and schedules is already outdated. High school students routinely earn transferable college credit, school-to-work models extend learning to other locations, and charter schools offer choices among learning environments. Yet "any time, any place, any path, any pace" learning that modern technologies make possible has the potential of opening the education system much, much further.

Schools transformed by e-learning in concert with other reform initiatives can operate very differently. They need not be limited to certain facilities—schools can reach out to wherever learners are through whatever tools and techniques make sense at the time, whether it is television, radio, CD-ROM, e-mail, or the Internet—and provide personalized guidance and support as needed to help learners achieve excellence.[20] Every student could have an individual education plan tailored to her or his skill level, aptitude, interest, maturity, talent, and mental acuity.[21] Teachers could use a statewide information system to organize instruction for each student while the state—and families—continuously monitor the student's progress. Recast as "learning institutions," schools and classrooms can become hubs in a wider networked learning community.

Online education will not make schools disappear entirely. For most families, social and economic realities that require both parents to work make it necessary for government to continue to provide safe and supervised environments for children and youth. Young people need organized physical activity, social interaction, and the guidance of caring adults for their healthy physical, social, and psychological development.[22]

Researchers have found that exposure to the Internet can help preschoolers and children in the early grades master literacy and other cognitive skills and also can spur integration of those skills early in their development.[23] Some interactive software programs have been shown to increase problem-solving abilities among kindergartners. Former U.S. Secretary of Education William Bennett's commercial K12 program relies on online activities for about 25 percent of the work for kindergarten through second grade. Previously a skeptic about education technology, he now writes that the Internet-connected computer "can help motivate, stimulate, entertain, and keep children informed about the world."[24] Some cite the benefits of allowing bright but bored elementary children to take online courses available to older students, and to allow all students to explore topics that interest them at a pace they choose.[25]

A major survey on parents' attitudes about their children's use of the Internet conducted by the National School Boards Association found that the Internet does not disrupt children's everyday habits and typical, healthy activities and does not appear to isolate children from their families, peers, or communities.[26] In fact, once they start using the Internet, many children reportedly spend less time watching television; more time reading newspapers, magazines, and books; increased time playing outdoors; and increased time doing arts and crafts. The survey found that children (and parents) use e-mail, chat rooms, and instant messaging to connect with other people, not avoid them. Parents, including low-income parents, said they would like to be able to communicate with their children's teachers.

The David and Lucile Packard Foundation recently published a valuable issue of *The Future of Children* that sets forth in detail what is known about children and computers, pro and con.[27] Another current resource is *Technology in Early Childhood Education: Finding the Balance* from the Northwest Regional Education Laboratory.[28] Clearly, more research is required on the benefits, deficiencies, and appropriate uses of e-learning for young children.

### Embracing the Information Age

Enabled by a technology-rich learning environment, an Information Age education system would be marked by:

- a focus on learning, not schools;
- learning organizations defined by mission, not by geography and facilities;
- student-focused, customized learning, not mass-produced, one-size-fits-all instruction;
- self-directed and holistic learning, not regimented recitation;
- learning on a 24/7 basis and throughout the year, not artificial schedules and calendars;
- empowerment of families and educators, not bureaucracies; and
- a number of options and educational providers for each student, not a standard model for all.

Michael David Warren, Jr., Michigan State Board of Education

**Research Findings**

- The U.S. Department of Education has compiled selected examples of research on the effectiveness of education technology.[29]
- The David and Lucile Packard Foundation has compiled a similar list of major studies on the effectiveness of computers as learning tools.[30]
- The Milken Family Foundation summarized many studies in "The Impact of Education Technology on Student Achievement: What the Most Current Research Has to Say."[31]
- The Software and Information Industry Association (SIIA) annually publishes a report on the effectiveness of technology in schools; the executive summary is free.[32]
- For enlightening examples of powerful uses of technology in math education, such as analyzing the motion of a girl doing a cartwheel, see the online paper "Technology Meets Math Education: Envisioning a Practical Future."[33]

Indeed, the National Research Council stresses that education research and the experience gained from pioneering e-learning initiatives provide a clear lesson: effective learning requires that technology resources for education—whether a software science simulation or an interactive reading exercise—function in a ***social*** environment, mediated by learning conversations with peers and teachers.[34] American Federation of Teachers President Sandra Feldman notes that, "Teachers have to look right at that young child, to see, for example, hand-eye coordination."[35] Terry Link of the Michigan State University Library writes, "True teaching and learning are about more than information and its transmission. Education is based on mentoring, internalization, identification, role modeling, guidance, socialization, interaction, and group activity."[36]

## Transforming teachers

Would the widespread use of e-learning mean the end of teachers as we know them? Again, yes and no.

While some political leaders might hope that e-learning could free schools of the need for highly qualified, highly paid teachers in every classroom, learning research strongly suggests that most students, most of the time, will continue to need the assistance of onsite teachers who are well qualified to teach specific subjects. The National Research Council emphasizes that: "Adults play a critical role in promoting children's curiosity and persistence by directing children's attention, structuring their experiences, supporting their learning attempts, and regulating the complexity and difficulty of levels of information for them." They also conclude that the effective use of education technology involves many teacher decisions and direct forms of teacher involvement.[37]

The continuing need for teachers is beyond question, but the role of the teacher will change. Yong Zhao and Paul Conway see teachers as designers of their own teaching environment, with a variety of technological tools to facilitate knowledge construction.[38] Teachers would not just be adopters or implementers of technology, but also developers and evaluators—architects of learning.

Thomas Carroll, Director of the Preparing Tomorrow's Teachers to Use Technology (PT$^3$) grant program of the U.S. Department of Education and a member of the Study Group, envisions learning environments in which teachers are considered expert learners, while students are seen as novice learners who are on their way to becoming mature learners through a life-long learning process.[39] The teacher's job would not just be to transfer information and skills, but to personally model the learning process through collaboration with students solving problems and achieving goals they have in common. The teacher as co-learner would organize and manage learning experiences and help students navigate the subjects being explored.

## Transforming the system

e-Learning is a "disruptive technology" in the same way that the steam engine entirely transformed sea transpor-

tation.[40] The shipping industry never reaped the true benefits of steam power until it reached a stage of constructive transformation, when ships were entirely redesigned with a different hull shape, stripped of their sails, and built from steel. Reluctant sailors also had to be completely retrained before the industry achieved tremendous benefits from the new technology.

As has been proven time and again in the private sector, the introduction of new technologies into an existing institution without fundamentally reforming the organization and retraining its staff typically yields little gain. Major improvements are only seen after thorough restructuring: without it, adding new technology can be an expensive waste of time and money.

Critics of education technology rightly point out that the heavy investments of recent years appear to have resulted in disappointingly modest gains in student achievement. Does this prove that education technology is a waste of money? Or does it prove that the mere presence of computers in traditional classrooms does not ensure their effective use? PBS commentator David Thornburg notes that, "How you use technology in education is more important than if you use it at all. Learning does not take place better or faster simply by replacing one instructional medium with another."[41]

John Bransford and his colleagues from Vanderbilt University point out that unstated assumptions about the current structure of schools—the schools most of us personally experienced—can unconsciously and unnecessarily constrain our thinking about learning, technology, and education.[42] To illustrate the point, the chart below outlines some questions that implicitly assume that education technology initiatives should enhance the current system, contrasted with alternative questions that open up possibilities for new ways of thinking and innovative solutions.

Study Group member Michael David Warren, a member of the Michigan State Board of Education, lists several key barriers to creating an Information Age education system:[43]

| Questions that assume the current education system | Questions that do not assume the current education system |
|---|---|
| How can computers improve schools? | How can new technologies enhance learning wherever it happens? |
| How is today's technology best used in the classroom? | How might emerging new types of networked computers and digital devices be harnessed to enhance learning? |
| What are the best ways to help all students equally master the standard curriculum? | How do we support mass customization that fit individual sets of interests, strengths, and needs? |
| How can online courses be made to fit within the school schedule and calendar? | How can education leaders assure that students have access to every learning opportunity they need? |
| How can K-12 teachers (and teachers of teachers) learn to use technology to enhance their lesson plans? | How can teachers learn to be fellow learners along with their students, in a way that everyone teaches each other and learns from one another? |
| How can we motivate educators to use existing research findings well? | How can we motivate educators to use research and also become pioneers who themselves create and share new knowledge? |

effective were electrified were emancipated were enabled were energetic were engaged were enhanced were enlivened were enriched were ensemble were equitable were essential were everyone were every-pace were everywhere were expanded were experiential were

- a reluctance by practitioners to consider new approaches to teaching for learning;
- a lack of incentives and external pressures to motivate change;
- insufficient training and professional competencies;
- resource allocation methods that perpetuate the status quo; and
- governance obstacles.

Changes in policy can effectively address the latter four points, but perhaps the most challenging barrier is the first. Education leaders must work to overcome the doubts of current educators who may be nervous about their roles in a technology-dependent education system, or who are afraid of taking risks. Phillip Schlechty of the Center for Leadership in School Reform in Louisville, Kentucky points out that a major leadership factor for change is the ability to "behave strategically," which means not only adopting new ways of doing things but deliberately stopping out-dated ways—often difficult because long-standing practices usually have constituencies whose interests are threatened.[44]

Many administrators, policymakers, parents, and members of the general public also find comfort in maintaining traditional institutions and practices—as demonstrated by the difficulties involved in changing school calendars, report cards, or bus schedules. Dr. Andee Rubin of TERC, an education research organization, describes how the general public sometimes suffers from inaccurate visions of technology and,

**New Technologies in Perspective**

Just because an educational task can be conducted using technology does not mean it should be. There are many aspects of education for which computers are very poor substitutes for existing methods. No videoconference will be as good as a face-to-face meeting. No portable display device on the market today is as cheap or has the image quality of a printed page. It is a mistake to think that new media displace old ones. People didn't stop painting pictures once the photographic camera was invented. Nothing of value is gained by moving drill and practice from a cheap workbook to an expensive computer screen.

On the other hand, no book can contain an interactive multimedia program, and no pencil can be used to build a student's simulation of an ecosystem. The key idea to keep in mind is that the true power of educational technology comes not from replicating things that can be done in other ways but when it is used to do things that couldn't be done without it. Word processors are wonderful tools, but they are simply an extension of the typewriter. Multimedia authoring tools, on the other hand, allow the creation of expressive media that was impossible to achieve before computers came to our classrooms. This doesn't mean we should stop using word processors, only that we need to be on the constant lookout for the new things technologies let us do in education—things that were inconceivable in the pre-wired classroom.

David Thornburg, The Thornburg Center[45]

thus, their support in terms of money, expertise, and even political goodwill can be unreliable.[46] Some are over-optimistic about the potential effects of technology, see it as a panacea, and imagine it reducing the costs of schooling while at the same time increasing schools' effectiveness. They might expect that computers could be attuned to meeting each student's needs with limited effort on the part of teachers. Dr. Rubin notes that such a point of view can lead to unrealistic expectations and, in the end, to disillusionment with the entire enterprise. An important challenge of leadership, therefore, is to be realistic about the possibilities of e-learning and to avoid overstated idealism.

The reality is that each piece of equipment, software, and every online service has inherent limitations as well as possibilities. Though they can be expected to help narrow inequities in education, advanced learning technologies alone will never be able to solve all the complex challenges involved in improving public education.[47]

Education leaders must also be prepared to admit that e-learning is not a quick and simple solution that will have immediate results. Although America's recent economic boom is largely credited to structural changes in business made possible by new technologies that resulted in significant productivity gains, it took many years and billions of dollars before productivity rose.[48] West Virginia can directly attribute across-the-board increases in all basic skill areas on its assessment scores, including an 11 percent increase in mathematics and language arts scores, to its statewide technology initiative.[49] However, this progress was seen only after a decade of implementation of a comprehensive K–6 program that coupled intensive professional development with the installation of standardized hardware and software—a degree of commitment few other states have been able to muster.

Policymakers also need to be cautioned about placing inordinate emphasis on the sheer existence of technology as the driver of change. Instead, successful innovation is primarily based on human, social, and process factors. Naive "techno-hunger" or "web-ecstasy" should not be allowed to overshadow consideration of all the factors at work. Critics' concerns about the social, ethical, financial, and educational consequences of technology innovations need to be seriously considered.

Finally, education leaders should try to model the practices they expect of other education personnel. Increasing numbers of policymakers are finding that e-mail and the Internet can be valuable vehicles for connecting board members and communicating with parents and the general public.[50] And board members too can pursue their own professional development online. For example, the National School Boards Association is offering educators, administrators, and school board members online technology courses through its ITTE: Education Technology Programs department,[51] and the Florida Virtual School offers a course over the Internet entitled "A Blueprint for Online Learning" to assist policymakers interesting in developing a student-centered, web-based education program.[52]

## Seizing policy opportunities

Moving toward a transformed education system that takes full advantage of e-learning entails a large number of policy challenges. The Study Group urges that education decisionmakers approach these challenges as ***policy opportunities*** because they provide openings to demonstrate leadership in areas where the ultimate pay-off is sure to be great.

Along with the National Governors Association and the Milken Exchange on Education Technology, the Study Group stresses the need for every state to develop a long-term policy agenda, developed with widespread collaboration and guided by a compelling vision for educational improvement.[53] Such a strategic plan, overseen by a standing advisory committee, is essential for reengineering the education system, providing steady stewardship over time, and assuring policy coherence.

The remainder of this report addresses major issues identified by the Study Group that education leaders with a long-term perspective can use as guideposts on the road to making a real difference. The policy areas are grouped into three broad chapters:

- Reengineering the System;
- Assuring Equity; and
- Delivering Quality Instruction to Learners.

Several policy aspects of each area are examined in more depth. Policy examples and options are included where possible to guide policymakers in their deliberations.



effective learning electrified learning emancipated learning enabled learning energetic learning engaged learning enhanced learning enlivened learning enriched learning ensemble learning equitable learning essential learning everyone learning every-pace learning everywhere learning expanded learning experiential learning

Specific recommendations cannot apply to every state, school district, and school. Historical traditions and existing policy frameworks vary too much from place to place for "one-size-fits-all" solutions. However, we hope that states, school districts, and schools will consider this report a useful roadmap for choosing policy priorities. Foremost, we hope that policymakers will expeditiously ***take the lead*** in developing e-learning policy and overseeing its implementation.

### Additional Roadmaps for State Policymaking

Several organizations have produced useful documents to guide state-level policymakers (there are also many others geared to the school and district levels):

- *The Power of the Internet for Learning: Moving from Promise to Practice*, the report of the Congressionally sponsored Web-Based Education Commission.[54]
- A state policy framework self-assessment tool, developed by Dr. Chris Dede of the Harvard Graduate School of Education, categorizes and charts the evolution of state policies that support the use of technology.[55]
- *Plans and Policies for Technology in Education: A Compendium, 2nd Edition* from the National School Boards Association.[56]
- From the Milken Exchange on Education Technology of the Milken Family Foundation:[57]
  - *Technology in American Schools: Seven Dimensions for Gauging Progress: A Policymaker's Guide.*
  - *Transforming Learning through Technology: Policy Roadmaps for the Nation's Governors.*
- From the CEO Forum on Education and Technology—each report includes a chart to track progress:[58]
  - *Key Building Blocks for Student Achievement in the 21st Century* (with a focus on outcomes and assessment).
  - *School Technology and Readiness* (with a focus on digital learning).
  - *A Self-Assessment Tool for Colleges of Education* (with a focus on teacher preparation).
  - *Professional Development: A Link to Better Learning* (with a focus on professional development).
  - *From Pillars to Progress* (with a focus on hardware and connectivity).

# III. Reengineering the System

Education technology is too often considered an add-on to the education system, offering additional methods of instruction to supplement standard operating practice. As frequently seen in public education, this approach can lead to "Christmas tree schools" adorned with expensive baubles that hang in isolation with little practical effect on student performance.

Restructuring the public education system to maximize the benefits of e-learning requires attention to basic policy foundations. These foundational policies exert powerful, if subtle, influences over the day-to-day behaviors of teachers, administrators, and students.

## Revising learning standards

***Policy opportunity:*** **Revisit what should be stressed in state and district academic standards.**

Nearly every state has now developed academic standards that detail "what students should know and be able to do" by the time they graduate from school. As hoped for when the standards reform movement got underway, it is increasingly clear that standards and aligned assessments are indeed having a pronounced effect on what happens in classrooms.

Now that e-learning makes it possible for students to learn new and different things, policymakers have an opportunity to broadly think again about the types of abilities truly required to thrive in the modern economy. Nearly every major task force that has looked into e-learning policy issues recommends that states update their student academic standards to include the kinds of "information literacy" and higher-order thinking skills required to prepare the next generation to live in a "cybercivilization" where computing and communications technologies are ubiquitous and the economy is based on knowledge and services. These information problem-solving skills involve:[39]

- defining tasks;
- identifying information-seeking strategies;
- locating and accessing information;
- determining information's credibility, accuracy, and relevance (combating the attitude, "If I saw it on the Internet, it must be true");
- analyzing, organizing, and communicating the results of the information problem-solving effort; and
- evaluating the effectiveness and efficiency of the solution.

Content v. Context

**We used to live in a world where content was king. That world no longer exists. Content is abundant, and is, therefore, a poor basis on which to base an educational system. What is scarce today is context and meaning.**

David Thornburg[40]

In contrast, some states' standards consist mostly of lists of academic facts that every student needs to be able to recall for a test. Advanced learning technologies can indeed be used to help students memorize such factual information, but this "automated learning" is not the most efficient use of technology—most students can just as effectively learn such knowledge from textbooks.

Other states have adopted student academic standards that address skills and knowledge regarding technology, but in a stand-alone way, not integrated across all curriculum areas. In this case the full advantages of e-learning could be lost if teachers have no incentive to use technology as a routine, fully integrated instructional practice within every subject area.

This does not mean that current standards need to be completely overhauled. On the contrary, recent learning research tells us that factual knowledge best emerges out of active engagement with learning rather than out of textbook- and test-driven curriculum. Revising standards can be viewed as keeping up with changes in society and raising the bar on what constitutes an educated citizenry and workforce.

The International Society for Technology in Education (ISTE) has produced well-regarded National Education Technology Standards for Students.[62] About 30 states have moved toward incorporating technology into all subject areas, many using the ISTE standards for guidance.

## Bringing state assessments online

### *Policy opportunity:* Develop and implement computer-based assessment systems.

Dr. James Guthrie of the Peabody Center for Education Policy at Vanderbilt University suggests that computer-based state assessments will prove to be the key that drives the rapid adoption of e-learning by every teacher in every classroom.[63] Teachers' facility with technology will grow when they realize that their students will need to be proficient in its use in order to score well on state exams. Assessment will also be an important vehicle for getting schools equipped and online. Computer-based testing has many of the characteristics of a disruptive technology, and it is likely to become the "killer app" of the education world.

In addition to providing necessary information for program, school, and district accountability, advanced technologies have great potential for transforming educational assessment for the better in several ways:

- **Saving costs:** The logistics of disseminating, administering, scoring, and reporting paper tests in ways that assure test security now costs states, districts, and schools a substantial amount each year. Although the cost of developing new state assessments is significant, once they are up and running a state will almost certainly save a considerable amount of money in staff time, printing, warehousing, and shipping costs.[64]
- **Measuring technology and information literacy skills:** Does it make sense to test

Information Is Not Knowledge

**Information is a wonderful thing, but it is not knowledge. You wouldn't be educated if you managed to memorize the entire encyclopedia. You would just be weird.**

Historian David McCullough[61]

a student's technology skills and knowledge using a paper-and-pencil test? The CEO Forum on Education and Technology argues that as schools and districts seamlessly integrate technology into the curriculum, methods of assessment should reflect the tools employed in teaching and learning.[65]

- **Measuring higher-order thinking skills:** New technologies can feasibly assess complex thinking skills that traditional multiple-choice tests cannot.[66] A recent study found that urban high school students using a computer-based algebra tutor system performed much better on tests that stressed their ability to think creatively about a complex problem when compared with peers who learned algebra through conventional methods. However, the computer-using students showed only a small advantage on standardized tests that do not adequately measure such higher-order thinking skills.[67]

- **Adapting to students' abilities and learning styles:** A computer-based "adaptive test" presents items of appropriate difficulty to each examinee, with immediate feedback about right and wrong answers. Questions that are too easy or too difficult are rarely asked, so fewer questions can be administered to obtain an accurate score. This reduces frustration on the part of the student while simultaneously providing a better picture of the student's knowledge and abilities. Some states' driver-licensing systems are using this approach.

- **Assessing the abilities of special needs students:** Universally designed assessments that include a full range of customizations and adaptations can more accurately evaluate the performance of all students. For example, students with limited proficiency in English using multimedia could assemble oral, visual, and written portfolios demonstrating their conversational skills and problem-solving abilities, as well as other work products that display their linguistic and academic competencies.

- **Creating greater flexibility in administration:** Every student does not have to be tested at the same time. Assessments can be embedded in electronic learning activities. Student progress can be documented in digital portfolios, as the Edison Schools are doing. These strategies can make assessment an ongoing process instead of a periodic, stressful event, and can also facilitate sampling.

- **Facilitating rapid and flexible reporting and analysis of results:** Test results can be electronically scored and reported much faster than traditional tests, sometimes by using AI (artificial intelligence) technology that can grade responses on writing tests with 98 percent reliability.[68] The Educational Testing Service (ETS) declares that official scores for its computer-based tests are reported within 10 to 15 days.[69] Centralized electronic tracking systems could permit aggregation at any level, while teachers and students could access individual scores. Florida is beginning to track individual students' progress from year to year so as to increase the fairness of its school accountability system. Texas reportedly aims to go further by tracking migrant students' progress as they move from school to school.

- **Providing useful diagnostic information to teachers:** In traditional assessment, only the outcomes of learning are measured—the number of science facts recalled, the percentage of words spelled correctly. The interactive capacity of new technologies allows frequent, dynamic assessments that measure not just the outcomes but the *processes* of learning.[70] In so doing teachers will be able to understand what kinds of strategies a student is following and thereby help determine the teaching methods that best match the student's learning style.

- **Linking to higher education entrance requirements:** With appropriate privacy safeguards, centralized electronic student assessment systems can be tied directly with community college and state university enrollment application systems. Besides providing convenience and efficiency, such linkages would provide higher education a more complete picture of their applicants' abilities for guidance and placement purposes.

- **Keeping up with changes in society:** Students reportedly prefer computer-based testing.[71] Parents will soon demand it. Researchers have found that paper-and-pencil



effective • electrified • emancipated • enabled • energetic • engaged • enhanced • enlivened • enriched • ensemble • equitable • essential • everyone • everyplace • everywhere • expanded • experiential •

writing tests "severely underestimate the achievement of students accustomed to writing using a computer" by four to eight points on an eighty-point scale.[72]

Already, several large-scale assessments including the GRE, the GMAT, and the TOEFL have gone online, and pilot studies are underway for the SAT and GED tests. The National Assessment of Educational Progress (NAEP) is taking a lead role in exploring online assessment at the elementary and secondary levels, with a goal of administering its tests by 2004.[73] Oregon, South Dakota, and Virginia have been pioneering the development of high-stakes state assessments, with Georgia, Florida, and Pennsylvania close behind. Every major test publisher is investing in computer-based assessment, as well as some companies not previously involved in assessment such as Oracle, IBM, and Cox Communications.[74]

Yet the reality is that researchers are still wrestling with technical issues of validity, reliability, and comparability with traditional tests. This suggests that in the short run state policymakers should cautiously experiment with pilot projects while at the same time begin to build public support for the concept of online testing.[75] Computerized testing should begin at the classroom level, where stakes are much lower. Clearly, significant resources need to be devoted to research and development, including cost-benefit analysis, and the federal government is in the best position to do this.

Among the policy issues being raised by the efforts to date are the following:

- Policymakers need to be clear about the purposes and goals of the assessment program.
- Transferring existing paper and pencil tests to the Internet is costly, and the effort does not take full advantage of what the new medium has to offer. Although also expensive, experts suggest that it is more cost effective in the long run to develop online tests from scratch.
- Teachers need professional development and support to help them prepare and support their students for computer-based testing. In their pilot studies NAEP officials also found that they needed to identify and closely work with school technical staff.
- Schools have vast differences in equipment, student:computer ratios, connectivity speeds, and provision for timely technical support. Among the challenges this raises is that variations in school equipment can cause test items to display differently from one student to the next. One suggested solution is to have mobile carts carrying standard-issue wireless-connected laptops from one classroom to the next.[76]
- Although test security issues are fewer than with paper-and-pencil tests, continuing technical challenges include assuring student identification, protection against "hackers," and not allowing a computer to do anything else while a test is underway.
- The early bird gets stuck with the check. Initially, it is costing Oregon nearly $600,000 a year to pay a testing company to run its pilot online testing program.[77] Virginia is spending more than $2 million on implementation of its demonstration program in nine high schools, not including the cost to schools of acquiring the necessary equipment.[78]

An interesting policy question for the future is what to do when voice response systems have improved their reliability and many students—not just those with disabilities—are routinely dictating their school work.

## Steamlining policies

***Policy opportunity:*** **Adopt or revise state and local policies for efficient administration of e-learning and review policies that can result in counterproductive incentives or inhibit e-learning.**

It is often the case that policies adopted for the efficient administration of traditional schools can interfere with e-learning methods and programs. For example, instructional requirements that specify a certain number of contact hours are inappropriate in a transformed system that measures student achievement instead of how long it takes the student to achieve a given level of proficiency. "Seat time" requirements, attendance policies, and mandated student:teacher ratios can trip up online courses. Many age and grade distinctions might also be no longer relevant.

Following are some additional policy questions that the Study Group identified during its exploration of e-learning issues:

- What should be the basis for granting a diploma? The 2000 Commission on Technology and Adult Learning, which primarily focused on workforce training, called for increased reliance on new means of assessing and certifying learning results that emphasize individual skills and knowledge rather than courses taken or credit hours earned.[79] Direct measures of what an individual actually knows and is able to do were said to be more valuable than a record of classes taken. Transferring this concept to the public school context calls into question the entire system of grades, discrete courses, and Carnegie units for credit. Schools could instead document students' attainment of specific knowledge benchmarks and their demonstration of discrete skills.

- Communications technologies have great potential to end the isolation of schools within their communities. Schools can offer Community Education, Adult Basic Education, and Continuing Education credit in concert with other agencies. Learning services that are made available over the Internet can potentially be accessed by anyone. As an example of how a school can serve more than the usual group of students, the Michigan Virtual High School (a private, nonprofit institution initially funded by the state) is broadening its focus to adults, drop-outs, homebound students, and students who have fallen behind.[80] Another virtual school in Michigan welcomes senior citizens who never earned diplomas, plus anyone who is simply after personal enrichment.[81]

- Many schools and districts appreciate state guidance and assistance in planning the use of technology. State education departments can establish voluntary, regularly updated guidelines for technology infrastructure, equipment, technical support, appropriate use, and protection of students.

- Advanced technologies allow for the efficient and cost-effective collection, analysis, and use of data for decisionmaking at all levels. State education departments can establish systems for collecting and aggregating educational data ("data mining") and allow widespread access to it, with appropriate privacy safeguards, for policymakers and instructional staff at all levels. Statewide information management and student tracking systems can address student turnover and mobility challenges.

- Teachers have generally not been trained on how to make the best use of student achievement data to make instructional decisions. This could be an important element of professional development programs in states that establish data systems to track the performance of schools and individual students.

- States can supplement the federal government's support for basic learning research, program evaluation, and wide dissemination of findings.

- States can establish statewide consortia for pooled discount purchasing of equipment and licensing of commercial e-learning courses. For example, the Massachusetts Department of Education provides a vendor list of reputable companies to help schools make wise purchasing decisions.

- Some states that issue approved lists of instructional software and online courses have review processes that are too slow to keep up with rapidly changing technology products.[82] Vendors who respond to a state RFP might have created several new versions of the product by the time an administrative decision is made. A five-year review cycle is two lifetimes within the software industry.

- Similarly, unyielding budget calendars and lack of flexibility in spending can be barriers. This is one reason cited for a large nationwide backlog of using e-rate discounts. More than $880 million (24 percent) of the $3.7 billion committed to applicants for the first two program years remained unused as of January 2001.[83]

- Experts suggest that schools be required to adopt long-term budget plans using the Total Cost of Ownership (TCO) approach, which takes into account costs of installation, training, day-to-day systems support, upgrades, software, and maintenance over the life span of purchased equipment.[84] Estimates of per-student costs per year for an Internet-connected computer range from $142 to $490, but most schools allocate much less, with the result that equipment is sometimes left sitting on a shelf.

- Some state-funded programs help schools to purchase technology but not to lease it.[85] Leasing is not always the best option, but it can allow for rapid replacement cycles so that schools can stay ahead of the obsolescence problem. Depreciation rules can also affect technology replacement practices. Sometimes the lack of flexibility can be traced to state procurement laws designed for a different era.

- Educators have long experience with purchasing equipment, supplies, and services from private vendors—but not direct student instructional services. Competitive bidding requirements might not adequately address the unique circumstances of purchasing or licensing commercial e-learning courses.

- Teachers are often hampered in the use of technology by a serious lack of adequate planning time in the school day.

- The increasing need to respond to involved parents' e-mail messages is becoming a burden for some teachers. Districts and schools might need to develop guidelines for school-family communications, including employee response-time standards.

- How states measure success in implementing technology can hold back the adoption of sophisticated computers and telecommunications.[86] A low-level indicator such as a simple ratio of students to computers, no matter how old or inadequate the devices are, can present an overly favorable picture of technology infrastructure. Similarly, enumerating the number of schools connected to the Internet is less useful than counting high-bandwidth connections to individual classrooms and computer systems with advanced computers.

- Salary schedules need to be flexible enough to pay market wages for the kind of advanced technical expertise that it takes to design, implement, and manage complicated high-tech systems.[87]

The pace of the policymaking process might itself be a barrier in the fast-moving world of education technology. States and districts need to establish efficient means to quickly identify policy barriers to e-learning and to update their policies as necessary.

## Empowering families

***Policy opportunity:*** **Consider the extent to which the public education system should offer and provide choices to families among different ways of organizing and delivering learning services.**

Modern technologies make it possible to empower families to choose among numerous learning options. Some envision a future system in which families would be provided with a wide range of educational choices, within traditional schools and without.[88] Custom-tailored instruction would be delivered by a number of providers who guarantee results. Parents would direct with whom and how education dollars are spent. Government would fund learners, not schools.

Such a far-reaching overhaul of the education system would be politically challenging to bring about in the near future because it raises the most fundamental issues of how public education is organized, staffed, funded, and held accountable. Operationalizing the family empowerment model would most likely to involve the following policy elements:

- dependable state assessments that measure everything the state considers essential for a student to become well-prepared for adult life, including non-academic outcomes such as physical fitness and healthful living skills;

- a reliable statewide system for tracking and monitoring the progress of individual students within and across every type of learning option;

- effective communications mechanisms that provide families with the essential information and guidance they need to make wise educational choices;

- various incentives to encourage the development of additional learning options if the private sector leaves gaps in available learning services;

- a trustworthy mechanism to assure instructional program quality;

- funding formulas that provide fair reimbursement for instructional programs that can vary widely in operational costs for valid reasons;

- a thorough and well-funded research and evaluation design that identifies characteristics of successful and unsuccessful programs to inform policymaking and practice at all levels; and
- a back-up system for students whose parents choose to be less involved or relinquish their responsibility to manage their children's education.

The practical barriers to implementation are formidable. Nevertheless, the concept helps to envision alternatives to the current way education is organized and delivered. Among the policy questions for today's system that can be raised are:

- Should school districts only grant credit and pay for online courses if the student is enrolled in a local public school?
- Who makes the final decision as to which online courses a school will pay for—the state, the principal, school guidance counselor, or the parent?
- Can a diploma be granted for successful completion of an education program provided entirely online?
- Should families be helped to purchase computers, Internet services, and other information technologies? Which families?
- Should states and districts allow home-schooling parents access to online instructional materials and services that are made available to teachers in the public schools? If so, should such access be free? Or how would a fair fee be determined?
- What types of fiscal and instructional program accountability mechanisms—if any—should be established for "cyber charter schools"?

### Cyber Charter Schools in Pennsylvania

In the spring of 2001, nearly 60 Pennsylvania school districts refused to pay invoices worth an estimated $840,000 to the Western Pennsylvania Cyber Charter School. The Pennsylvania School Boards Association challenged the legality of cyber charter schools, arguing that the state's charter school law did not envision online education and does not establish the necessary framework for ensuring financial and educational accountability.[89] They say the effect is to divert public funds to what in effect are home schooling programs that do not meet accountability requirements established by the state's home schooling law. Some 60 percent of the 1,100 students enrolled in the Western Pennsylvania Cyber Charter School had been home schooled students who did not previously draw on state and local funds.[90]

A preliminary court injunction has allowed the state to deduct the amount of the invoices from the school districts' state subsidy payments and pay the charter school. Although the court has yet to issue a final decision, six more cyber charter schools will commence operation for the 2001-02 school year.

One of these is the Pennsylvania Virtual Charter School, managed by William Bennett's online education firm K12.[91] K12 charges families $895 per grade for a complete program, while the charter school is anticipating being paid an average $5,000–$7,000 per regular student from each student's district of residence. Each teacher will manage instruction for 40 to 50 families, beginning with grades K–2. Additional grades will be added each year. The charter school expects to enroll 15,000 students from across the state by 2004.

The Pennsylvania Legislature has ordered a study of the situation. Already, legislation has been introduced requiring state licensing of cyber charter schools and enabling the state to fund them directly.

- As online courses can be considerably cheaper to deliver if there is no physical school building to operate and maintain, should cyber charter schools receive the same amount of per-pupil funding as other schools?

## Moving beyond geographic boundaries

***Policy opportunity:*** **Determine how best to work through policy issues that cross state boundaries.**

e-Learning allows the availability of educational opportunities across geographical boundaries, but state policies can create unnecessary barriers. For example, Apex Learning, one of the major nationwide private firms that offers instructor-led online classes, decided to focus on offering Advanced Placement classes because students in every state can use them. Vice President Paul Bloom told the Study Group that Apex would like to develop regular education courses as well, but complex cross-state barriers—such as differences in states' academic standards and teacher certification requirements—make the task impossibly daunting. If markets are restricted to single states, private providers are prevented from reaping economies of scale by developing courses that can be offered regionally or nationwide.

Some states already have reciprocity agreements for teacher licensure and certification. Some sort of new nationwide credentialing system may be in order to recognize, for example, the emerging new education specialty of online learning now being offered by several universities.

Similarly, new institutions might be necessary to grant nationwide accreditation or facilitate quality assurance processes for Internet-based courses and programs. At the very least, states ought to collaborate on using common criteria for instructional design, content, teacher qualifications, student-teacher interaction, technical support, assessment, and course evaluation.

# IV. Assuring Equity

The Study Group firmly believes that the most valuable benefit of e-learning is its potential ability to deliver high-quality instructional services to all learners regardless of location, family or cultural background, or disability. Assuring universal opportunity is a critical policy foundation.

## Ensuring high-quality educators for all children

***Policy opportunity:*** **Redouble efforts to establish policies and programs to ensure that well-prepared and well-supported teachers are equitably deployed across all settings so that every student is served by instructional staff who provide effective guidance and assistance.**

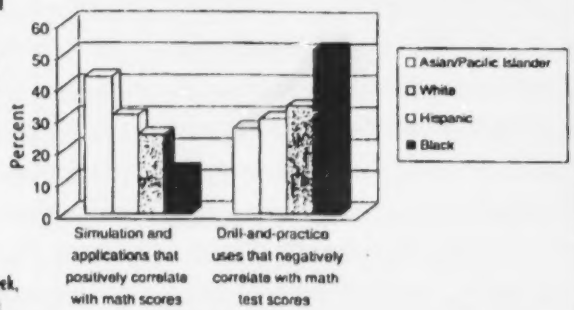
The "digital divide" has commonly been considered an issue of disparities among various population groups relating to who has physical access to computers and online services. Although the federal E-Rate program and similar initiatives have achieved rapid progress in connecting schools and classrooms to the Internet, the disturbing reality is that the digital divide remains wide in a more pernicious form: inequities in instructional practice, that is, in how effectively modern learning technologies are being used with different groups of students. The greater the level of poverty, the more likely that computers will be used for drills and the less likely computers will be used for Internet research and other creative applications.

A landmark 1998 study by ETS, using National Assessment of Educational Progress (NAEP) mathematics achievement data, found that use of computer-based simulations, spreadsheets, and math learning games to teach higher-order thinking skills raised test scores. But when computers were used for rote drill-and-practice exercises, students actually did ***worse*** than those who did not use learning technologies (see Chart 4 on page 28).[92] The study also found major differences among groups in terms of which students were using which instructional methods.

In a more recent survey, the National Center for Education Statistics confirmed that teachers in schools with high minority enrollments tend to use educational technology less frequently, and in less useful ways (see Chart 5 on page 28).[93] *Education Week's 2001 Technology Counts: The New Divides* provides a thorough analysis of how advanced

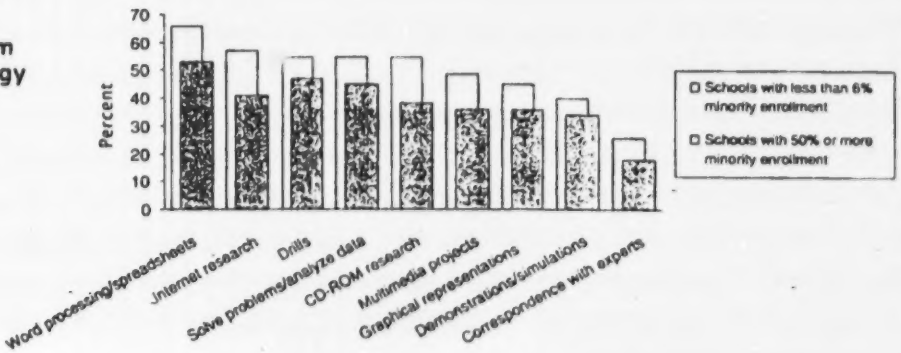
**Issues of teacher preparation, licensure, deployment, professional development, evaluation, and ongoing support—issues much broader than what is typically addressed in state and district education technology plans—should be considered the most important focus for assuring equity in e-learning opportunity.**

Chart 4
**Differential Uses of Classroom Computers**




Source: Education Week, Technology Counts '98

Chart 5
**The Digital Divide in Uses of Classroom Technology**




Source: National Center for Education Statistics

technologies are being used with different groups of students.[94] It also provides numerous examples of districts that are trying to address the issue.

***Issues of teacher preparation, licensure, deployment, professional development, evaluation, and ongoing support—issues much broader than what is typically addressed in state and district education technology plans—should be considered the most important focus for assuring equity in e-learning opportunity.*** Policymakers can work with teacher associations to develop new policies and practices designed to reduce teaching-related disparities in e-learning at every stage of the teacher development cycle.

**Teacher preparation:** NASBE's 2000 Study Group report, *The Full Circle: Building a Coherent Teacher Preparation System*, described in detail a coordinated standards-based system for teacher preparation and ongoing support. The report addressed effective collaboration between higher education institutions and preK-12 schools, including the concept of preK-16 education systems; linking programs *within* higher education; linking preparation programs with the first years of teaching; and making each aspect of the system accountable for results. The report provides numerous examples of successful programs and policy actions from across the nation.

As for what teacher candidates need to learn specifically about technology, education curricula and state



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certification requirements have to go considerably beyond simple training in software. Experts say that future teachers most need discipline-based courses in which technology is integrated into the course content, not individual courses on new media and teaching methods.[95] They should be initiated into habits of reflective practice that will allow them to adapt and innovate in new learning environments throughout their careers, even as specific technologies and applications change. Saul Rockman argues that a focus on learning, not teaching, also means relinquishing control over students who have access to computers and the Internet.[96] Teachers will need to know when to "get out of the students' way."

Dr. Chris Dede of the Harvard School of Education makes the point that teacher preparation institutions often lack good infrastructure and are "frequently low on the totem pole of university technology investments."[97] He suggests that these institutions be included in state initiatives to aid districts in purchasing technologies.

**Licensure, certification, and periodic recertification:** Policies for teachers' initial licensure, certification, and periodic recertification should ideally be aligned with requirements for pre-service preparation. North Carolina has led the way with the adoption of Technology Competencies for Educators, both for pre-service teachers and as part of the five-year cycle for licensure renewal. Connecticut, Georgia, North Carolina, and Virginia also include effective uses of technology in their teacher recertification requirements—but at last count, another 34 states have recertification requirements that do not reference technology.

### Key Resources

Several groups have issued recommendations on what educators should know and be able to do in regards to effective uses of education technology:

- The International Society of Technology in Education (ISTE) has produced *National Education Technology Standards for Teachers.*[98]
- The National Council for Accreditation of Teacher Education (NCATE) in association with ISTE has produced *Program Standards for Educational Computing and Technology.*[99]
- The CEO Forum on Education and Technology has produced *A Self-Assessment Tool for Colleges of Education* and *Professional Development: A Link to Better Learning.*[100]
- The Milken Exchange on Education Technology produced *A Continuum for Professional Development: Gauging Professional Competency for Technology-Supported Learning.*[101]
- The National Commission on Mathematics and Science Teaching for the 21st Century (the Glenn Commission) produced *Before It's Too Late.*[102]
- The Collaborative for Technology Standards for School Administrators (TSSA Collaborative) sponsored by the American Association of School Administrators (AASA) offers a draft of new Technology Standards for School Administrators.[103]

Dr. Barbara Means of SRI International points out that teacher licensure tests for technology typically stress general computer skills rather than the ability to incorporate technology into instruction within subject areas.[104] She suggests that performance and portfolio assessments of teacher candidates' skill in teaching should include using technology to enhance student learning.

**Continuous professional development:** In a survey by NetDay released in May 2001, 94 percent of teachers said they ***do*** feel comfortable using computers, and 87 percent ***are*** comfortable with the Internet, but 67 percent admitted that the Internet is not well integrated into their classrooms and has not changed the way they teach.[105] Some 60 percent of teachers with school-based Internet access reported spending less than 30 minutes a day using it.

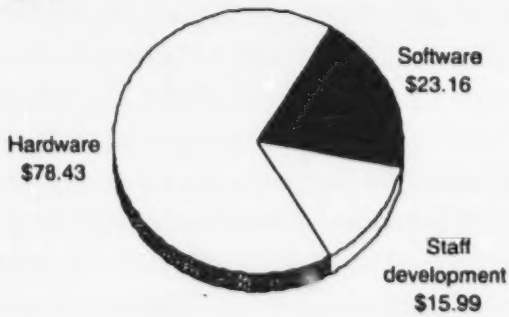
Another recent survey by the National Center for Education Statistics found that 43 percent of teachers reported having just one to eight hours of training in classroom technology in the past three years.[106] Ten percent reported no technology training at all. Education Week's *2001 Technology Counts* report found that teachers of students from low-income homes, students with disabilities, students with limited English proficiency, and low-achieving students are in particular need of sustained professional development in how to use technology most effectively.

In response, some states and school districts are working toward making professional development a routine practice so as to retrain the current education workforce in new instructional techniques and the effective use of learning technologies. Arkansas, Florida, Tennessee, and West Virginia have established time requirements for technology-related professional development for all teachers.

The fact that 98 percent of all U.S. schools are now connected to the Internet offers unprecedented opportunities for educators as well as their students to take advantage of "any time, any place, any path, any pace" e-learning to enhance their pedagogical and administrative skills in an ongoing manner. The Internet can potentially deliver to every educator in every school a wide variety of formal and informal courses available on demand, from brief skills-boosting courses to labor-intensive master's degrees. Online learning allows teachers and administrators to experience the same instructional practices they are expected to use with their students, such as project-based learning, assembling electronic portfolios, and searching out and critically evaluating information on the Internet. Compared to traditional training programs, private sector businesses estimate that the cost savings in the initial year of online training may be 20 to 30 percent, with savings increasing substantially in subsequent years. Much of the savings is due to lower travel costs.

The broad consensus of experts is that at least 30 percent of any technology budget should be spent on staff development. However, a Spring 2001 survey of 35,000 public schools sponsored by Market Data Retrieval found that staff development accounted for less than 15 percent of technology expenditures in academic year 2000-2001, or just $15.99 per student (Chart 6).[107]

Chart 6
**Technology Spending per Student, Academic Year 2000–2001**




Source: *New York Times*





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States and districts can use a variety of policy instruments to encourage and support quality professional development:

*Requirements:*

- certain numbers of hours or days of in-service training, which can be electronically tracked;
- licensure renewal provisions and professional development standards that include effective uses of technology;
- local technology plans that include professional development; and
- local budget set-aside for professional development.

**Professional Development Program Examples**

The **Florida** Learning Alliance (FLA) has developed a comprehensive Professional Development System for the information technology environment.[108] The framework includes:

***Standards:*** A comprehensive set of standards for electronically delivered staff development is based on the work done by the Southern Regional Educational Board and North Carolina. The standards address content and instructional design and take into account the unique features of five electronic delivery modes: online (web-based), CD-ROM, computer-based, stored video, and dynamic video (live broadcast).

***Review of products:*** Review instruments have been constructed and reviewers trained to apply the standards to professional development products, whether created by a vendor, higher education, other providers, or by one of the FLA partners.

***Staff Development Management System (SDMS):*** Working in close cooperation with the Florida Department of Education, FLA is designing a comprehensive staff development management system for all school and district staff. The SDMS will be a web-based one-stop shop to manage:

- acquiring and maintaining credentials of staff;
- identifying and tracking professional development activities completed and needed; and
- monitoring and tracking staff development functions for school and district administrators.

The **Maryland** State Department of Education, in partnership with Johns Hopkins and Towson Universities, operates an annual Maryland Technology Academy composed of a three-week Leadership Program for educators, a two-day symposium for school administrators, follow-up sessions during the school year, and an ongoing web-based learning community.[109] The partners have also expanded the Academy to satellite sites of the state's Regional Professional Development Network.

Project MEET (**Massachusetts** Empowering Educators with Technology) is a statewide collaborative of nationally recognized organizations providing technology professional development in multiple districts across the state.[110] One element is the training of a corps of technology professional development (TPD) specialists who support teachers. In addition, Massachusetts supports PDPortfolio, a professional development website for educators that helps educators search for courses listed by professional development providers. PDPortfolio includes courses for all subject areas, covering all Massachusetts educator licenses.

**Louisiana** INTECH, an adaptation of a Georgia program, is an intense, content-rich, hands-on, 56-hour staff development program.[111] INTECH teams of teachers learn basic technology skills while focusing on project-based activities that are aligned with the Louisiana Content Standards. Five critical areas characterize this integrated training approach: (1) classroom management techniques, (2) new designs for learning, (3) best pedagogical practices, (4) curriculum standards, and (5) modern technology skills.

*Incentives:*

- salary increases for achieving professional development goals;
- state-funded discretionary programs to establish and operate professional development activities; and
- support for teachers aiming for National Board of Professional Teaching Standards certification, a process that involves use of advanced learning technologies.

*Building capacity:*

- developing courses;
- developing systems for online assessment of teaching skills;
- establishing infrastructure for peer-to-peer communications networks; and
- establishing teacher academies and regional professional development centers.

**Key Resources**

The North Central Regional Education Laboratory (NCREL) offers a good overview of online professional development programs.[112]

See the literature review entitled "Technology to Support Teacher Development," prepared by the Peabody College of Vanderbilt University.[113]

A number of resources are available from the National Staff Development Council (NSDC), including a thoughtful paper entitled "To Reap the Benefits of Online Staff Development, Ask the Right Questions."[114]

**Virtual communities of practice:** Opportunities for a teacher to enroll in high-quality online courses might not make a difference to a school's performance if the teacher's new knowledge and skills are not effectively translated into classroom practice. In particular, experts say teachers need to have opportunities to collaborate with peers who support each other through mutual coaching, joint planning of lessons, and critiquing of student work.

Using modern communications technologies, teachers can be linked into geographically extended "virtual communities of practice" in which ideas are routinely shared on issues of immediate concern, such as gathering advice on "How do I handle this kind of classroom disruption?" Such networking can also connect higher education faculty and other outside experts to teachers in need of specific assistance.

**Teacher evaluation:** States and districts might want to design an accountability system that includes actual teacher performance in a technology-rich classroom.[115] An evaluation process could assess if a teacher:

- uses technology resources and methods appropriate to the subject area;
- successfully organizes and manages classrooms in which students are using technology resources and skills; and
- assesses what their students are learning with technology.

Dr. Barbara Means notes that rigorous performance assessment systems are technically challenging and expensive to implement, however. Thorny issues include fairness, reliability, validity, training challenges, and the legal defensibility of such a system, particularly if high stakes are attached to performance results.

## Providing access to robust equipment and the Internet at school

***Policy opportunity:*** Establish programs, acquire funding, and work with other agencies to ensure that every student has access at school to the equipment, software, fast Internet connections, and other resources necessary to take full advantage of e-learning opportunities.

> Fulfilling Our Democratic Creed
>
> **The E-Rate...lies at the heart of the continuing struggle to create communications and education systems that fulfill our democratic creed. This sweeping innovation, which ensures students access to telecommunications services through schools and libraries, represents an enormous stride toward realizing the dream of universal access to the basic prerequisites of democracy.**
>
> Benton Foundation[116]

e-Learning requires that students and teachers have access to good computers and reliable connections to the Internet. In a September 2000 report, the National Center for Education Statistics found that more than three-quarters of teachers cited a lack of computers at school as a concern; nearly two-thirds cited "outdated, incompatible, or unreliable" computers; and nearly six in ten cited the fact that "Internet access is not easily accessible."[117]

Enacted as a part of the Universal Service Program of the Telecommunications Act of 1996, the federal "E-Rate" program is providing discounts to public and private schools, libraries, and consortia on the costs of telecommunications services, Internet access, and internal networking. High-poverty and rural districts get first priority on the funds available. Since its inception in late 1998, the program has committed more than $5 billion to connect public and private schools and public libraries, and over one million classrooms have been wired.[118] A February 2001 report from the Federal Reserve Bank of Kansas City concluded that, "Despite mixed results, at this point the E-Rate must be considered a success for rural America. Millions of dollars in discounts have flowed to remote areas, and advanced services are now available in small communities that might otherwise never have seen them."[119]

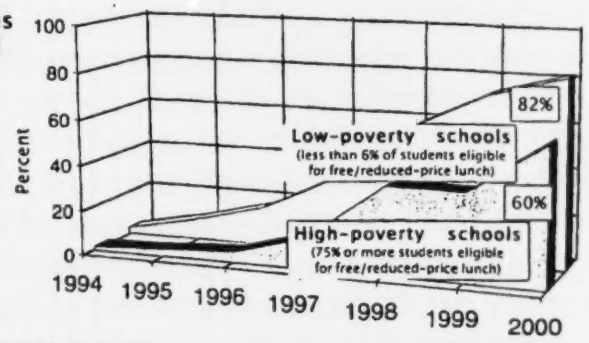
According to the U.S. Department of Education, schools with more than half of students eligible for free and reduced-price lunch represent only 25 percent of public school students, yet they have received over 60 percent of E-Rate funds awarded. Because of the effort to serve the poorest students, those districts receive almost ten times the E-Rate funding per student when compared to the wealthiest districts. Yet a May 2001 report from the National Center for Education Statistics demonstrates that classrooms in high-poverty schools are still less likely to have an Internet connection compared to classrooms in schools that have many fewer students living in poverty (see Chart 7 on page 34).[120]

Not all Internet connections are of equal value. Fast, reliable, ubiquitous broadband connections that can support interactive communications and rich multimedia content are necessary for effective online learning. As the Web-Based Education Commission notes, "For education, broadband access means the elimination of time and distance from the learning equation."

Following are some actions that education policymakers can do to facilitate broadband connectivity in schools:

- **Gather data and monitor the situation.** For example, Maryland conducts an inventory of technology resources in all of its public schools

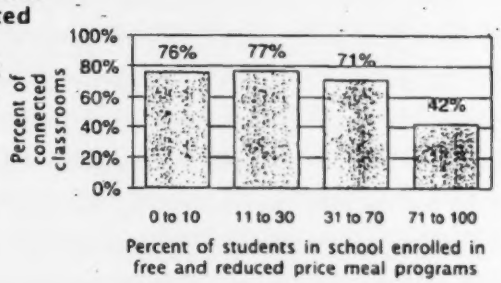
Chart 7
**The Digital Divide in Classrooms Connected to the Internet**




Source: National Center for Education Statistics

each year. These inventories have measured progress toward specified targets in key areas, such as access to equipment and networks, availability of technical support, level of teacher knowledge and skills, and use of technology. The Technology Inventory was conducted for the first time electronically in late 1999, allowing for more timely review and release of data including statewide summaries, local school system summaries, and individual school results. For 2001, correlation of the technology inventory data with the state database of student enrollment in the Free and Reduced Meals program allowed a valuable assessment of the extent of Maryland's digital divide (see Chart 8).[121]

Chart 8
**Maryland Schools: Percentage of Classrooms Connected to the Internet**




- **Advocate for continuation and expansion of Universal Service programs.** The E-Rate program has repeatedly come under attack in the U.S. Congress as a "hidden tax" on consumers' phone bills. Advocacy advice is available through the Education and Libraries Networking Coalition (EdLiNC), which was formed to represent the viewpoint of schools and libraries in FCC proceedings dealing with the implementation of the Telecommunications Act of 1996.[122] In addition, state education policymakers can establish working partnerships with their own state telecommunications authorities to develop and implement additional Universal Service programs, as well as lobby legislatures to establish tax incentives to encourage technology investments in underserved areas.



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- **Assure that the state department of education is doing all it can to assist local schools and districts to apply for E-Rate funding.** The schools with the greatest need might also be those with the least capacity to prepare technology plans and administer complex and unfamiliar paperwork.

- **Establish statewide communications infrastructures.** Many states have connected their schools in statewide telecommunications networks. They have generally used federal resources available through the Technology Literacy Challenge Fund, sometimes supplemented with additional state funds. The state-owned and operated Iowa Communications Network is perhaps the most ambitious, providing two-way interactive videoconferencing, broadband connections to the Internet, and long-distance phone service for nearly every public and non-public school, public and non-public university, community college, and library in the state.[123]

- **Negotiate volume discounts with telephone and other communications companies.**

- **Provide adequate funding for school renovations and technology.** Reliable sources of funding are needed for electrical upgrades, equipment acquisition, and ongoing costs of telecommunications services not covered by the E-Rate. One suggestion is to establish "learning technology trust funds" to help sustain long-term school technology investment momentum.[124]

## Providing after-school access

***Policy opportunity:*** **Establish programs, acquire funding, and work with other agencies to ensure that every student has convenient and affordable access to the equipment, software, fast Internet connections, and other resources necessary to take full advantage of e-learning opportunities when school is out.**

Too many economically disadvantaged and minority group students lack access to instructional technologies away from school. The Pew Internet and American Life project found that fully 73 percent of young people ages 12 through 17 have Internet access—but 11 percent of them said their primary Internet access location is their school.[125] The U.S. Commerce Department warns that, "We are approaching the point where not having access to these tools is likely to put an individual at a competitive disadvantage and in a position of being a less-than-full participant in the digital economy."[126]

Education leaders can take a number of actions to make sure that all young people have adequate access to the education opportunities of e-learning, including:

- **Advocate for adequately funded programs to provide students with after-school e-learning opportunities.** As an example of what policymakers can establish, the U.S. Department of Education's 21st Century Community Learning Centers (CLC) program enables schools to stay open longer, providing a safe place for homework centers, intensive mentoring in basic skills, enrichment in the core academic subjects, technology education programs, and services for children and youth with disabilities.[127] About 6,800 rural and inner-city public schools in 1,420 communities—in collaboration with a host of public and private entities—are now participating in the program.

  The Morino Institute's YouthLearn program maintains a website that provides resources and a knowledge base for those starting or implementing out-of-school programs that integrate technology.[128] PowerUP is a group of dozens of non-profit organizations, major corporations, and state and federal government agencies that have joined together in a positive youth development initiative to install computer labs in schools, public housing complexes, youth serving facilities, and community centers throughout the country.[129]

- **Advocate for affordable Universal Services policies and adequately funded programs to provide students with opportunities for e-learning at home.** According to the U.S. Commerce Department, when asked why they lacked Internet access, 17 percent of all unconnected households responded that it is too expensive. A significantly higher percentage of minority and low-income households reported that Internet access was cost prohibitive.

Elisabeth Stock, Executive Director of Computers for Youth, a New York City-based nonprofit, argues that providing community access to computers in school, libraries, and technology centers, while necessary, is not sufficient.[130] She makes a case that public policy to close the digital divide must also focus on bringing technology into homes. In 1999 her organization distributed 228 home computers to families and teachers at a school in the South Bronx, trained 470 members of the school community, provided technical support and tailored web content, and paid for the first three months of Internet access. A preliminary study after the first year of operation showed that students were using their computers for such meaningful activities as homework, word processing, and finding information on the Internet at the same rate as other school-age children across the nation. Teachers reported that their students' schoolwork has improved in presentation and in quality.

- **Open school buildings and their technology infrastructures to community use.** Although progress has been made in reducing the digital divide, a February 2001 study reports that large disparities remain based on income (only 38 percent of those earning less than

**Key Resources**

A wealth of resources concerning all aspects of the "digital divide" are available:

- The Benton Foundation operates a Digital Divide Network website that offers a range of information, tools, and resources that help practitioners stay on top of digital divide developments.[132]
- The U.S. Commerce Department's National Telecommunications and Information Administration (NTIA) has established a central digital divide website for the federal government's activities regarding Americans' access to the Internet and other information technologies. Included are several important reports such as *Falling through the Net: Toward Digital Inclusion* (October 2000).[133]
- The Pew Foundation's Internet and American Life Project funds original, academic-quality research that explores the impact of the Internet on children, families, communities, the work place, schools, health care, and civic/political life. Among their reports are *Who's Not Online, Hispanics and the Internet,* and *African-Americans and the Internet.*[134]

**Schools as Community Access Centers**

If our schools are equipped with the modern technologies of information and communication, they can serve as resources not just to our children but to the community at large. This expanded role of schools as community access centers also fits with the reality that we have entered an era where lifelong learning is a necessity, not a luxury. Schools available to all, open day and night, can become the common meeting ground for communities—places where we see the power of a democratic society in action. What better force can one imagine to bring people together in pursuit of the continued development of our free society than such places? Schools where young and old can learn, places where ideas can be shared, leverage points for economic development—all these and more become possible when we re-envision schools as active wired community access points to the entire planet.

David Thornburg[135]

$30,000 per year use the Internet, compared to 82 percent of those earning $75,000 or more) and educational attainment (only 39 percent of those with a high school degree or less, compared to 82 percent of those with a college degree or more).[135] Other surveys show that schools, libraries, and other public access points serve groups that do not have Internet access at home, such as the unemployed and ethnic minority populations. Households with incomes of less than $20,000 and African-American households, for example, are twice as likely to get Internet access through a public library or community center than are households earning more than $20,000 or white households.[136]

Education policymakers can encourage districts and schools to establish cooperative programs and communications links with community agencies and organizations. For example, schools can establish links to employment opportunities, internships, and apprenticeships that teach marketable skills. Cisco Systems has established Networking Academies in all 50 states in which students earn industry-standard certification.[137] The U.S. Commerce Department's National Telecommunications and Information Administration (NTIA) provides funding for "community access centers" such as schools, libraries, and other public access facilities.[138] The U.S. Department of Education's Community Technology Centers (CTC) program funds start-up and expansion costs of such centers in economically distressed communities.[139]

## Supplying technologies to assist students with special needs

***Policy opportunity:*** **Establish policies and acquire funding to ensure that all students with special needs (disability, language, setting) effectively gain the benefits of online courses and other instructional resources in ways equivalent to other students.**

Over the past 20 years, the number of students with disabilities and other special needs has been increasing at a faster rate than school enrollment.[140] Estimates of learners who need special accommodation range as high as 40 percent, including those with disabilities, cultural barriers, and those who speak English as a second language. Encouragingly, teachers have found that technological innovations can help level the playing field for special needs students and help them to succeed in the regular classroom.[141] The policy issues concerning equitable access can be categorized as follows:

- providing assistive technologies for students with disabilities;
- assuring that Internet websites are accessible;
- providing learning technologies for language minority students; and
- adopting Universal Design for Learning principles for all educational materials.

**Providing assistive technologies for students with disabilities:** An "assistive" or "adaptive" technology device is defined as any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.[142] For example, a student with a motor disability might benefit from using a pointing device to control a computer that can be controlled by breath or voice or by tracking the motions of a person's head, foot, eye, or body. Voice-recognition software can translate speech into text. The range of assistive technology devices and products is extremely broad, with a long list of equipment, programs, products, and services available for each category of disability.

While federal law mandates that free, appropriate public education (FAPE) be provided to all children with disabilities, too few students with disabilities are benefiting from advanced technologies that can help them learn to the best of their abilities. The major barriers are said to be teacher preparation and cost.[143]

As students with disabilities are supposed to be placed in the "least restrictive environment" to the extent possible and assistive technologies help make it feasible to keep them in the regular classroom, all teachers need to be able to use these technologies—not just special educators. Teacher preparation programs therefore need to provide some basic orientation to using technology with special needs students, as Illinois is doing. The types of online

professional development discussed earlier in this report, whereby a teacher can access precisely the information and training he/she needs when he/she needs it, is particularly suited to supporting teachers' use of assistive technologies.

While an Individual Educational Plan (IEP) may call for the use of an assistive technology for a student, the cost of the device, product, or software may not be included in the resources available to the child's school. Assistive technologies, while readily available, are not often included in state and federal funding formulas. Computer and software for a visually impaired child can cost $6,000 to 8,000 per year. Education policymakers therefore need to advocate for adequate funding of appropriate assistive technologies for all who need them.

Related policy issues include:

- assistive technology devices provided by schools should be permitted to be used after school and away from school;
- IEPs should include student acquisition of technology-related skills for learning and for work; and
- states and districts should conduct systemic, comprehensive planning and policy development processes that include needs surveys.

**Assuring that Internet websites are accessible:** The U.S. Department of Commerce has found that people with a disability are only half as likely to have access to the Internet as those without a disability: 22 percent compared to 42 percent.[147] Those who have impaired vision and problems with manual dexterity have even lower rates of Internet access. One reason is that a physical connection to the Internet does not guarantee access to its content.

For people with disabilities the web can be a challenging place.[148] For example, many websites present obstacles for those using screen readers that translate text to speech but cannot translate graphics. Audio files without text transcripts and videos without captions are inaccessible to those with hearing impairments. Sites that are rich with text provide little information to those with reading difficulties. For some people with disabilities, such barriers can mean lack of access to information needed for educational programs;

**Key Resources on Assistive Technologies**

An article by Ted Hasselbring and Candyce Williams Glaser in the Fall/Winter 2000 issue of the Packard Foundation's *The Future of Children* offers a good overview of the types of assistive technologies that are available to educators.[144]

*Technology for Students with Disabilities: A Decision Maker's Resource Guide* from the National School Boards Association discusses how technology applications can help (a) children participate in classroom activities, master basic skills, and learn complex material, and (b) educators assess and evaluate student progress and instructional programs. Also discussed are how to choose appropriate technology and find the funds to pay for it, as well as how to create and monitor a technology plan. The guide ends with an extensive list of organizations and individuals who can provide more information to those who use technology in assisting students with disabilities.[145]

ABLEDATA is a federally funded project whose primary mission is to provide information on assistive technology and rehabilitation equipment available from domestic and international sources to consumers, organizations, professionals, and caregivers within the United States. The ABLEDATA database contains information on more than 27,000 assistive technology products from white canes to voice output programs.[146]

### "Bobby"

"Bobby" is an efficient, easy-to-use, free public service that helps web developers make their pages accessible.[149] It was created by the Center for Applied Special Technology (CAST), a non-profit organization whose mission is to expand opportunities for people with disabilities through innovative uses of computer technology.

Bobby analyzes HTML pages for conformity to the Web Access Initiative (WAI)'s Web Content Accessibility Guidelines, and translates them into instructions for improving their accessibility. Within seconds of typing in a URL, Bobby delivers a full accessibility report on the webpage being analyzed, specifying each barrier and explaining how to eliminate it. For example, if Bobby finds images that do not have essential supplemental text descriptions (alt tags), it highlights the errors and specifies the remedy.

Like its British law enforcement namesake, Bobby is meant to help, not reprimand; it provides prioritized suggestions for making sites more accessible. A site that is deemed accessible can display the "Bobby Approved" icon.

### Key Resources on Internet Accessibility

The Web Access Initiative of the World Wide Web Consortium (W3C) has produced several iterations of Web Content Accessibility Guidelines.[150]

California Community Colleges have "Access Guidelines for Students with Disabilities" developed in response to a review by the U.S. Education Department's Office for Civil Rights.[151]

The Microsoft Corporation has detailed instructions on developing accessible software and Internet sites.[152]

lack of access to employment-related information or workplace intranets; lack of access to information on civic activities or programs; or lack of access to information on the web in general.

All Internet sites operated by public education institutions should meet web accessibility standards, as is now required for all federal agencies.[153] Education departments can use "Bobby" (refer to the box above) to gauge how accessible any particular website is.

**Providing learning technologies for language minority students:** e-learning opens many opportunities for students with limited English proficiency.[154] For example, handheld devices such as Palm Pilots can recognize handwriting in many languages. Voice recognition and Optical Code Reader (OCR) scanner software can roughly translate one language into another. The Internet allows students of virtually any language background access to sites and schools around the world that use the language.

Unfortunately, these products and services are rare. Few online courses or CD-ROM applications have been developed for bilingual education or English-as-a-second-language instruction. Policymakers should therefore support research efforts to develop materials and public-private partnerships to develop them into useful products. And, of course, the "digital divide" issues discussed earlier loom large with most language minority populations.

**Adopting Universal Design for Learning principles for all educational materials:** The Center for Applied Special Technology (CAST) notes that in the field of architecture "Universal Design" has come to mean designing facilities from the outset to be accessible to everyone.[155] The population as a whole benefits—for example, ramps, elevators, and curb cuts initially installed to accommodate people with disabilities have also proved useful for people with strollers, shopping carts, luggage, bicycles, and skateboards.

Learning materials such as books can be analogous to stairs because they can present insurmountable barriers to students with physical, sensory, and cognitive disabilities. The concept of "Universal Design for Learning" promoted by CAST means developing electronic materials with built-in options to increase access for learners with wide disparities in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, focus, engage, and remember.

For example, history texts provided in standard print formats are inaccessible to students who are blind and present barriers to students who are dyslexic or for whom English is a second language. The same material in universal-designed electronic format can be (a) read aloud by a computer or screen reader, (b) printed on a Braille printer, (c) offered in spoken or written translation, (d) presented with highlighted main points and organizational supports, and (e) include hyperlinks to definitions, elaborations, and related media for more in-depth understanding. These options offer new learning opportunities for students with a range of learning needs, interests, and abilities but can be turned on and off so as not to get in the way of learners who do not wish to use them.

CAST is urging the federal government to require that all educational materials developed with federal grant funds incorporate Universal Design for Learning technologies, and that it produces research based guidelines for states, districts, and publishers.[156]

# V. Delivering Quality Instruction to All Learners

The Study Group is convinced that every student should have access to appropriate e-learning resources for a quality education. Providing these opportunities and making them available raises many complex policy questions that can challenge basic assumptions governing the traditional education system and settled ways of doing business. This is an exciting time of innovation and experiment that provokes hopes—and fears—of fundamental change.

## Offering online courses for credit

***Policy opportunity:*** **Establish policies and procedures to encourage the universal availability of virtual schools and other opportunities for students to earn credit for taking a wide variety of classes online.**

At last count, some 13 states and at least 23 school districts have established "virtual high schools" that offer courses for credit.[137] Instruction can be provided primarily over the Internet or through videoconferencing, mail correspondence, computer-assisted instruction, television or radio, telephone, e-mail, videotape, or other delivery methods. The benefits typically include:

- expanded access for students attending rural schools, difficult-to-staff urban schools, and alternative schools, plus students who are homebound, parenting, working, or otherwise at high risk of dropping out, in military families, and world travelers;
- expanded course offerings, including Advanced Placement and college preparatory classes;
- scheduling flexibility—courses can be "synchronous" (students and the teacher are communicating at the same time), "asynchronous" (a student accesses the course material at any convenient time, usually by established deadlines), or some combination of the two;
- efficient aggregation of small numbers of scattered students into full classes;
- generally high-quality instruction by well-qualified online teachers, aligned with state standards and designed according to modern learning theories;
- effectiveness with diverse student learning styles due to the use of animated graphics, video streaming, audio representations, and other techniques; and
- effectiveness with diverse personalities such as students who are shy, students who are disruptive in the regular classroom, high achievers, and slow learners.

There are important differences to note between online and classroom-based face-to-face instruction. The pacing, content, and instructional methods a teacher uses in a traditional class is to a large degree dependent on students' reactions, both verbal and non-verbal, as continuously observed by the teacher. In contrast, the content of an online course is fixed in advance so the virtual teacher's primary role involves personal communications, assessment, and feedback to help students master that content. Liz Pape of the long-running Virtual High School, which as of 1999-2000 served students in 29 states, notes that it takes up to two-and-a-half times longer to teach an online course than it does a face-to-face course because of the time spent communicating electronically.[138]

Another lesson is that online learning is not for every student (though some would argue that traditional education is not for everyone, either). High attrition rates are common. Successful virtual students tend to have strong organizational skills and are motivated to do well, not afraid to ask questions, proficient at reading and writing, and comfortable using computers.[159]

Each state and district has approached the organization and operation of virtual schools somewhat differently to accommodate different goals. Experience gained to date provides many valuable lessons. Unexpected policy issues have also emerged that policymakers ought to consider and work out before courses go online.

**Determining who pays for what** at what price is an important early policy decision. According to Linda Cavalluzo of the CNA Corporation, whether a state chooses to support a virtual school out of its own revenues or charges tuition (user fees) to schools and/or families has important ramifications for both the virtual school and traditional schools.[160] If policymakers decide that the rapid growth of online educational opportunities is the priority goal, then the state should entirely fund its statewide virtual school—as Florida is doing—so that schools and families do not consider online courses an unaffordable extravagance. A related strategy would be to target subsidies to low-performing schools or schools with limited course offerings, but charge full price to students in other schools. Dr. Cavalluzo, an economist, points out that these policies can eventually distort school staffing decisions and equity-based funding formulas, and so the policies should be revisited frequently.

Some states charge fees to local schools to cover per-student operating costs of online courses—Kentucky, for example, charges $275 for a semester course and Illinois charges $300. Out of concern for local control, and perhaps the job security fears of the current education workforce, in these states students can only access the courses through their local school. Individual districts decide if their students can access online courses, which courses they can take, and if families will be charged tuition or the school will absorb the cost. One result appears to be much smaller growth in online course enrollments compared to states that fully fund their virtual schools.

Dr. Cavalluzo suggests that a state might want to offer the courses free at first and then gradually move toward a fee-based model. Tom Clark, who has studied the characteristics of many virtual schools, notes that a key concern for many systems is to craft strategies for sustainable funding.[161]

**How to develop online courses** is another key challenge. High-quality online courses are not easy or cheap to develop—should the state do it or rely on the private sector? APEX Learning reports that a single Advanced Placement course takes a 15-member team nearly eight months and $100,000 to $200,000 to develop.[162] Their well-regarded online courses take full advantage of the capabilities of computers and the Internet, offering simulations, animations, modeling, and interactivity. Tuition to enroll in an 18-week course is $475 per student, which includes online instruction and personal mentoring by an experienced teacher who is certified and/or possesses a master's or doctorate in the subject area.

States can negotiate volume licenses for courses provided by private vendors. Utah has operated an Electronic High School since 1994 that has acted as a clearinghouse, brokering access to high school courses by a variety of technology-based options.[163] Yet the school is now moving away from its reliance on using mostly out-of-state courses in favor of their own online core curriculum due to cost, quality, and lack of alignment with Utah learning goals.

The Illinois Virtual High School has established a cooperative, low-cost barter system as an incentive for course development. Each participating school can enroll students in IVHS-owned courses in proportion to the amount the school contributes in the form of online courses and online instruction.[164] Other states are providing mini-grants to school districts to bring together groups of teachers to develop online courses over the summer months (although the instructional quality of these courses is reportedly uneven).

Although several groups have developed criteria for "distance education" at the postsecondary level, little is yet available for K-12 online education.[165] North Carolina has developed "Essential Principles of Quality." The National Education Association (NEA) will also soon produce a criteria document developed in association with several organizations, including NASBE.

The traditional method of accreditation by a credible independent agency is potentially one way to help assure the quality of online courses. However, to date no accreditation agency appears to have worked out a thorough evaluation scheme and an efficient accreditation process for web-based programs. A key policy question is whether an entire program should be accredited, as traditionally done, or whether courses should be individually evaluated for quality. Additional policy questions are outlined in the boxes at right and on page 44.

**Providing on-site support.** States and districts should be sure to establish the necessary technical and instructional support for online courses and assist in providing the resources to do so. Experience suggests that a designated onsite adult liaison such as a guidance counselor needs to be conveniently available to the student—and to the online instructor.

Dr. Clark notes that student services are handled quite differently from state to state.[166] Some place almost all responsibilities on districts, while others have a centralized approach. Some offer virtual library access, online counseling, and other virtual services, while others arrange for in-person services.

**Following are some other essential questions that policymakers should consider before and during the process of setting up online courses and programs:**

**Course development**

- Who is in the best position to develop and offer online courses or broker and coordinate existing courses? Should the state establish incentives or offer grants for course development?
- What types of courses will be made available? What level—high school, middle school, upper elementary?
- How are intellectual property rights addressed? Who "owns" a course developed by an individual teacher—the teacher, the school, the district? Is a residual paid each time the course is taught?
- Can entrepreneurial districts and schools keep "profits" from developing and disseminating online courses?
- Do employment policies and practices inhibit prospective online teachers from working at home, working part-time, or working past retirement?
- How will information about courses be made available to local schools, students, and families?
- Will commercial courses be permitted to include advertisements?

**Administration**

- Who pays the tuition for online courses? Parents? The school? The school district? The state? Some combination of them—who decides? If parents, should family income or other characteristics be taken into account?
- How does the per-student state funding formula take into account students taking online courses? Who gets reimbursed—the school, the district, or the course provider? How are home-schooled students, dropouts, course repeaters, and other non-regular students handled by the state aid formula?
- Can a school assign students to take online courses instead of hiring a teacher for the subject?
- Who monitors completion rates for online courses attempted? Is student data maintained so as to assess who does well and who does not, and why?
- How will scheduling conflicts be worked out if an online course provider's schedule does not match the school calendar?
- Are there systems and procedures to track the use of online courses?
- Who is in the best position to negotiate volume discounts for online instructional services?
- Who determines if teachers of online courses are adequately compensated? Do they have contractual rights and protections?



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### Enrollment

- Are criteria and a process in place for determining under which circumstances online courses are an appropriate option?
- Are there minimum qualifications for students to be allowed to take online courses (e.g., computer skills, writing skills, self-discipline, age)?
- Can a student enroll in an online course if a similar course is offered at the school? If so, who is responsible for paying tuition?
- Should certain groups of students (e.g., rural, at-risk, drop-outs) get priority enrollment opportunities?
- Would an unwilling student ever be ***required*** to take an online course, because of a discipline problem, for example?
- Is parental notification and approval required prior to student enrollment in online courses?
- Can a student take elective courses online in any subject that interests him or her?
- Are there limits on how many courses students may take online? Can courses be repeated?
- Can private school and home-schooled students take online courses through a public school? How about school drop-outs? Should the school/district/state pay for them?
- Are courses available to students from other states or districts? How are fees determined?
- Are school guidance counselors provided training on how to guide students' choices and provide support?

### Granting credit

- Will online courses be granted the same credit and value as face-to-face courses?
- Who makes decisions about granting students credit for courses taken online? Is there an appeal process?
- Can a parent enroll a student in an online course and request credit for it without prior approval? How does this situation differ from granting credit to a student who transfers into the system? Who reviews the course for content and quality?
- Are multiple methods of assessment used to gauge student achievement of learning goals?
- Can a student earn an entire diploma taking online courses?
- What is the effect of taking online courses on a student's eligibility to participate in sports programs and other extracurricular activities?

### Quality assurance

- Are there procedures at the state and/or district levels to assess the quality of online courses? Does the process assess courses before they are offered? How is ongoing quality assessment handled?
- Can students only enroll in approved courses?
- Must all online courses be aligned with national/state/district academic standards and curriculum frameworks?
- Is course or program accreditation necessary? By whom?
- Does school/district accreditation mean that all online courses developed and offered by the school/district are accredited? Does the accrediting agency use an effective evaluation process?
- Can students with special needs (disability, language, setting) effectively gain the benefits of online courses in ways equivalent to other students?
- Will course quality ratings be publicly available?
- Should online teachers be required to participate in specialized training or to have earned specialized credentials?
- How is teacher evaluation handled for online teachers? How are their working hours kept track of? Do students have an opportunity to provide feedback?
- Do charter school laws adequately assure instructional quality when instruction is provided online?

### Support

- Are onsite liaison personnel made available to provide support for students enrolled in online courses? Who decides how much support is necessary? How are support staff paid?
- Does the budget allow for adequate and timely technical support to ensure successful instruction?
- Are students provided computers to use at home, or provided guaranteed computer time at school and after school, to participate in online courses?
- What will be the consequences for inappropriate student behavior or academic impropriety such as cheating?

## Providing other quality e-learning resources

***Policy opportunity:*** **Determine effective ways to rapidly expand the availability of a wide range of high-quality e-learning resources.**

e-Learning resources available from a wide variety of providers used to supplement the curriculum can take many forms:

- enrichment lessons or units such as simulations or animated graphics that illustrate certain topics, available on CD-ROM or "on demand" over the Internet;
- online libraries;
- access to museum holdings;
- exposure to primary sources, such as historical documents and newspaper records;
- communications directly with experts in the field;
- use of real data sets that allow students to contribute to their communities; and
- student-to-student interaction.

Many e-learning resources are available for free over the Internet; others must be purchased. In both cases, the sheer number of available resources can be overwhelming, and their quality is variable. There are several policy options for policymakers who want to help educators access a wide range of resources.

**Directed investment:** States can try to take on the task of developing e-learning resources through incentive and grant programs, working cooperatively with commercial vendors, universities, public television, and others. Ideally, creating high-quality materials involves a sustained, multidisciplinary collaboration of subject-matter experts, practicing teachers, learning scientists, and technologists.

Policymakers taking this approach should clearly express expectations that digital content and networked applications resources be:

- based on learning science and evidence of effectiveness;
- aligned with national, state, and/or district academic standards and curriculum frameworks;
- accurate and consistent with copyright laws;
- well-documented and easy to find, access, and use;
- able to inspire or motivate students; and
- accessible to students with special needs, whether disability, language, culture, or setting.

**The free market:** States and districts generally do not have the capacity to develop high-quality software and courses on their own. One option is to take a hands-off approach and trust the "magic of the market" to produce appropriate instructional resources that creative teachers and families can take advantage of. A problem with relying on the competitive market alone, however, is that certain instructional topics might get overlooked. For example, entrepreneurs might not make it a priority to develop resources for teaching every state's history. Similarly, a state whose academic standards are unique in some ways might not attract private vendors willing to develop customized instructional units.

Another problem with relying on the laissez-faire approach is that if one vendor comes to dominate a district, the vendor's proprietary standards can freeze others out of the local market for years to come. For example, Microsoft is unveiling comprehensive education software utilizing the new Windows XP™ operating system that integrates curriculum setting, lesson planning, gathering and providing lesson content, distributing and tracking student assignments, and assessing student progress.[167] Some competitors worry if their products can be incorporated into it.

**Becoming a "gatekeeper of quality":** States and districts can take on the task of reviewing and evaluating e-learning materials. Software Quality Assurance (SQA) is a process that helps educators look beyond the basic functionality of software to consider the myriad details that affect its efficacy in the classroom.[168] North Carolina has established distinct sets of criteria for the evaluation of computer software, audio/visual materials, CD-ROM-based reference databases, websites, and print materials.

### The Virtual Learning Space

Massachusetts sponsors a "Virtual Learning Space" that gives each educator in the state an individualized "Virtual Desktop" that provides access to:[169]

- state curriculum frameworks and district learning objectives that apply to their students;
- their own personal calendar that interacts with the school and organizational calendars;
- their own instructional planner or teacher online plan book;
- tools to make student assessment more comprehensive and easier to administer;
- a searchable database of lesson plans, units, and courses used successfully by other teachers that align to the state curriculum frameworks and their district learning objectives;
- communication tools with other teachers (discussion groups, bulletin boards, e-mail);
- a guide to accessing high-quality instructional web-based content resources; and
- a "virtual hard-drive" accessible anyplace, anytime.

An important policy question is whether teachers should be able to use state funds to purchase *only* approved resources, a practice long familiar to the many "textbook adoption" states.

**Establishing an "education portal":** Another useful role for states and/or districts is to help teachers with the daunting task of choosing among the almost limitless supply of resources available. "One-stop" access to a variety of resources, such as a statewide "digital library" that draws on university resources, can save teachers much time and energy. Teachers value gateway sites because they provide reliable starting points, filtering mechanisms, and sample curricula for using the web.[170]

An October 2000 paper on "Smart Desktops for Teachers" from the Education Commission of the States lays out in detail how emerging Application Service Provider (ASP) technology solutions can help educators deliver standards-based education to K-12 students.[171] The paper includes useful summaries of nearly 50 major vendors and their education products, plus detailed descriptions of what 16 states are doing. For example, Georgia Learning Connections is a teacher Internet gateway for lesson plans, curriculum materials, and other instructional resources that are aligned with the state's academic standards. The California Instructional Technology Clearinghouse is an educator's guide to more than 3,700 quality instructional technology resources that support California's curriculum frameworks and standards. Florida, Hawaii, Illinois, Minnesota, Pennsylvania, Vermont, and Washington are also among the states moving in this direction.

### Key Resources

The Southern Regional Education Board (SREB) uses North Carolina's quality criteria on its "EvaluTech" website, which features a free, searchable database that contains more than 5,000 reviews of instructional materials recommended for classroom use.[172]

The American Association of School Administrators offers guidance with its *Standards for Web-Based Education Products and Services: Guidelines for K-12 Educators.*[173]

The Association for Supervision and Curriculum Development (ASCD) offers *Only the Best: The Annual Guide to the Highest-Rated Educational Software and Multimedia.*[174]

## Protecting children

***Policy opportunity:*** **Develop and/or revisit policies addressing appropriate student use of the Internet, privacy protection, and advertising in public schools.**

Children need consistent adult supervision, protection, and guidance. It is incumbent upon schools to adopt policies designed to protect students as they engage in online activity. Online risks are many, including: meeting someone dangerous online; loss of privacy; getting into online "fights"; making threats or breaking the law; viewing inappropriate material; putting people in jeopardy by disclosing confidential family information; and encouraging, enabling, or exposing children to information on drugs and other dangerous substances.

A new federal law, the Children's Internet Protection Act (CIPA), requires that E-Rate and ESEA applicants have in place an "Internet Safety Policy" that includes monitoring the online activities of minors and the use of technology to filter or block obscenity, child pornography, and "material that is harmful to minors." Fortunately, a full range of technology tools and monitoring techniques to ensure that children do not encounter inappropriate material or dangerous situations while online are widely available. Technological tools include blocking software, filtering software, and monitoring and tracking software. Such tools limit or eliminate access to websites by URL, keyword, or category. In addition, many software packages are customized to perform monitoring reports of the user's activity or attempted activity.

Even though the Internet is included under the protections that allow for freedom of speech in the United States, advertising in the school environment is becoming a major concern. As pressures on school budgets and demands for new technologies increase, a new "dot.com" business model has emerged that offers "free" technology resources to schools supported by an online advertising program within the educational learning environment.[179] The position on commercialism in public schools adopted by the membership of NASBE is clear—"Selling or providing access to a captive audience in the classroom for commercial purposes is exploitation and a violation of public trust."[180]

### Key Resources

For an excellent overview of the various approaches to protecting students online, consult the "Privacy, Protection, and 'Safe Streets'" section of the Web-Based Education Commission report.

The GetNetWise coalition, a group composed of a wide range of Internet industry corporations and public interest organizations, has created a website with many resources that schools leaders and parents can use to make informed decisions about children's Internet use and minimizing online risks.[175]

The Federal Trade Commission offers "Frequently Asked Questions about the Children's Online Privacy Protection" rule on its website.[176]

The U.S. Department of Education offers the *Parents' Guide to the Internet.*[177]

The full report of the Commission on Online Child Protection (the "COPA Commission") is online, along with research papers and other information.[178]

The Children's Online Privacy Protection Act (COPPA) and its resultant Children's Online Privacy Protection Rule enforced by the Federal Trade Commission places parental control over what information is collected from their children by operators of commercial websites and online services. Ultimately, parents must decide what areas of the Internet are right for their own children's use, and students need to learn about avoiding online risks.

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